SEQUENCE LISTING


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     Phe Ser Ala Leu Arg Lys Asp Ala Ala Asn Val Leu Asp Phe Leu Glu
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55   Arg Leu Lys Asn Glu Glu Asp Gln Lys Ala Val Asp Val Asp Leu Ile
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60        50                  55                  60

     tct tat tcc gat ttg gag aag ttt gaa gat ata atg act aga aaa aga     240
     Ser Tyr Ser Asp Leu Glu Lys Phe Glu Asp Ile Met Thr Arg Lys Arg
     65                  70                  75                  80
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     caa gag gtt gag aat ctg ctt caa cca att ttg gat gat gat ggc aaa     288
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      Asp Cys Ile Ser Leu Tyr His Arg Ser Lys Ser Asp Ala Thr Met Met
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10    gat gag caa ttg ggc ttc ctc ctc ttg aat ctc tct cat cta tcc aag      432
      Asp Glu Gln Leu Gly Phe Leu Leu Leu Asn Leu Ser His Leu Ser Lys
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15    cat cgt gct gaa aag atg ttt cct gga gtg act caa tat gag gtt ctt      480
      His Arg Ala Glu Lys Met Phe Pro Gly Val Thr Gln Tyr Glu Val Leu
      145             150             155             160

      cag aat gta tgt ggc aac ata aga gat ttc cat gga ttg ata gtg aat      528
      Gln Asn Val Cys Gly Asn Ile Arg Asp Phe His Gly Leu Ile Val Asn
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      tgt tgc att aag cat gag atg gtt gag aat gtc tta tct ctg ttt caa      576
      Cys Cys Ile Lys His Glu Met Val Glu Asn Val Leu Ser Leu Phe Gln
                      180             185             190

25    ctg atg gct gag aga gta gga cgc ttc ctt tgg gag gat cag gct gat      624
      Leu Met Ala Glu Arg Val Gly Arg Phe Leu Trp Glu Asp Gln Ala Asp
              195             200             205

      gaa gac tct caa ctc tcc gag cta gat gag gat gat cag aat gat aaa      672
30    Glu Asp Ser Gln Leu Ser Glu Leu Asp Glu Asp Asp Gln Asn Asp Lys
              210             215             220

      gac cct caa ctc ttc aag cta gca cat cta ctc ttg aag att gtt cca      720
      Asp Pro Gln Leu Phe Lys Leu Ala His Leu Leu Leu Lys Ile Val Pro
35    225             230             235             240

      act gaa ttg gag gtt atg cac ata tgt tat aaa act ttg aaa gct tca      768
      Thr Glu Leu Glu Val Met His Ile Cys Tyr Lys Thr Leu Lys Ala Ser
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      Thr Ser Thr Glu Ile Gly Arg Phe Ile Lys Lys Leu Leu Glu Thr Ser
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45    ccg gac att ctc aga gaa tat ctg att cat cta caa gag cat atg ata      864
      Pro Asp Ile Leu Arg Glu Tyr Leu Ile His Leu Gln Glu His Met Ile
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      Met Glu Phe Leu Leu Ile Ile Leu Ser Asp Met Pro Pro Lys Asp Phe
55    305             310             315             320

      att cat cat gac aaa ctt ttt gat ctc ttg gct cgt gtt gta gca ctt      1008
      Ile His His Asp Lys Leu Phe Asp Leu Leu Ala Arg Val Val Ala Leu
              325             330             335
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      acc agg gag gta tca act ctt gta cgc gac ttg gaa gag aaa tta agg      1056
      Thr Arg Glu Val Ser Thr Leu Val Arg Asp Leu Glu Glu Lys Leu Arg
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      Ile Lys Glu Ser Thr Asp Glu Thr Asn Cys Ala Thr Leu Lys Phe Leu
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         370             375             380

5    gtc ccg gat tca tct caa tat tgc ttc ccc atg agt gat gga cct ctc    1200
     Val Pro Asp Ser Ser Gln Tyr Cys Phe Pro Met Ser Asp Gly Pro Leu
     385             390             395                 400

10   ttc atg cat ctg cta cag aga cac tta gat gat ttg ctg gat tcc aat    1248
     Phe Met His Leu Leu Gln Arg His Leu Asp Asp Leu Leu Asp Ser Asn
                     405             410                 415

     gct tat tca att gct ttg ata aag gaa caa att ggg ctg gtg aaa gaa    1296
     Ala Tyr Ser Ile Ala Leu Ile Lys Glu Gln Ile Gly Leu Val Lys Glu
15                   420             425             430

     gac ttg gaa ttc ata aga tct ttt ttc gcg aat att gag caa gga ttg    1344
     Asp Leu Glu Phe Ile Arg Ser Phe Phe Ala Asn Ile Glu Gln Gly Leu
                 435             440             445
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     tat aaa gat ctc tgg gaa cgt gtt cta gat gtg gca tat gag gca aaa    1392
     Tyr Lys Asp Leu Trp Glu Arg Val Leu Asp Val Ala Tyr Glu Ala Lys
             450             455             460

25   gat gtc ata gat tca att att gtt cga gat aat ggt ctc tta cat ctt    1440
     Asp Val Ile Asp Ser Ile Ile Val Arg Asp Asn Gly Leu Leu His Leu
     465             470             475             480

     att ttc tca ctt ccc att acc aga aag aag atg atg ctt atc aaa gaa    1488
30   Ile Phe Ser Leu Pro Ile Thr Arg Lys Lys Met Met Leu Ile Lys Glu
                     485             490             495

     gag gtc tct gat tta cat gag aac att tcc aag aac aga ggt ctc atc    1536
     Glu Val Ser Asp Leu His Glu Asn Ile Ser Lys Asn Arg Gly Leu Ile
35                   500             505             510

     gtt gtg aac tct ccc aag aaa cca gtt gag agc aag tca ttg aca act    1584
     Val Val Asn Ser Pro Lys Lys Pro Val Glu Ser Lys Ser Leu Thr Thr
                 515             520             525
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     gat aaa ata att gta ggt ttt ggt gag gag aca aac ttg ata ctt aga    1632
     Asp Lys Ile Ile Val Gly Phe Gly Glu Glu Thr Asn Leu Ile Leu Arg
         530             535             540

45   aag ctc acc agt gga ccg gca gat cta gat gtc att tcg atc att ggt    1680
     Lys Leu Thr Ser Gly Pro Ala Asp Leu Asp Val Ile Ser Ile Ile Gly
     545             550             555             560

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50   Met Pro Gly Leu Gly Lys Thr Thr Leu Ala Tyr Lys Val Tyr Asn Asp
                     565             570             575

     aaa tca gtt tct agc cat ttc gac ctt cgt gca tgg tgc acg gtc gac    1776
     Lys Ser Val Ser Ser His Phe Asp Leu Arg Ala Trp Cys Thr Val Asp
55                   580             585             590

     caa gta tat gac gag aag aag ttg ttg gat aaa att ttc aat caa gtt    1824
     Gln Val Tyr Asp Glu Lys Lys Leu Leu Asp Lys Ile Phe Asn Gln Val
                 595             600             605
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     agt gac tca aat tca aaa ttg agt gag aat att gat gtt gct gat aaa    1872
     Ser Asp Ser Asn Ser Lys Leu Ser Glu Asn Ile Asp Val Ala Asp Lys
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65   cta cgg aaa caa ttg ttt gga aag agg tat ctt att gtc tta gat gac    1920
     Leu Arg Lys Gln Leu Phe Gly Lys Arg Tyr Leu Ile Val Leu Asp Asp
     625             630             635             640
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**4**

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      gtg tgg gat act aat aca tgg gat gag cta aca aga cct ttt cct gat     1968
      Val Trp Asp Thr Asn Thr Trp Asp Glu Leu Thr Arg Pro Phe Pro Asp
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  5   ggt atg aaa gga agt aga att att ttg aca act cga gaa aag aaa gtt     2016
      Gly Met Lys Gly Ser Arg Ile Ile Leu Thr Thr Arg Glu Lys Lys Val
                      660                 665                 670

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      Ala Leu His Gly Lys Leu Tyr Thr Asp Pro Leu Asn Leu Arg Leu Leu
                      675                 680                 685

      aga tca gaa gaa agt tgg gag tta tta gag aaa agg gca ttt gga aac     2112
      Arg Ser Glu Glu Ser Trp Glu Leu Leu Glu Lys Arg Ala Phe Gly Asn
 15                   690                 695                 700

      gag agt tgc cct gat gaa cta ttg gat gtt ggt aaa gaa ata gcc gaa     2160
      Glu Ser Cys Pro Asp Glu Leu Leu Asp Val Gly Lys Glu Ile Ala Glu
      705                 710                 715                 720
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      aat tgt aaa ggg ctt cct ttg gtg gtg gat ctg att gct gga atc att     2208
      Asn Cys Lys Gly Leu Pro Leu Val Val Asp Leu Ile Ala Gly Ile Ile
                      725                 730                 735

 25   gct ggg agg gaa aag aaa aag agt gtg tgg ctt gaa gtt gta aat aat     2256
      Ala Gly Arg Glu Lys Lys Lys Ser Val Trp Leu Glu Val Val Asn Asn
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      ttg cat tcc ttt att ttg aag aat gaa gtg gaa gtg atg aaa gtt ata     2304
 30   Leu His Ser Phe Ile Leu Lys Asn Glu Val Glu Val Met Lys Val Ile
                      755                 760                 765

      gaa ata agt tat gac cac tta cct gat cac ctg aag cca tgc ttg ctg     2352
      Glu Ile Ser Tyr Asp His Leu Pro Asp His Leu Lys Pro Cys Leu Leu
 35   770                 775                 780

      tac ttt gca agt gcg ccg aag gac tgg gta acg aca atc cat gag ttg     2400
      Tyr Phe Ala Ser Ala Pro Lys Asp Trp Val Thr Thr Ile His Glu Leu
      785                 790                 795                 800
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      aaa ctt att tgg ggt ttt gaa gga ttt gtg gaa aag aca gat atg aag     2448
      Lys Leu Ile Trp Gly Phe Glu Gly Phe Val Glu Lys Thr Asp Met Lys
                      805                 810                 815

 45   agt ctg gaa gaa gtg gtg aaa att tat ttg gat gat tta att tcc agt     2496
      Ser Leu Glu Glu Val Val Lys Ile Tyr Leu Asp Asp Leu Ile Ser Ser
                      820                 825                 830

      agc ttg gta att tgt ttc aat gag ata ggt gat tac cct act tgc caa     2544
 50   Ser Leu Val Ile Cys Phe Asn Glu Ile Gly Asp Tyr Pro Thr Cys Gln
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      ctt cat gat ctt gtg cat gac ttt tgt ttg ata aaa gca aga aag gaa     2592
      Leu His Asp Leu Val His Asp Phe Cys Leu Ile Lys Ala Arg Lys Glu
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      aag ttg tgt gat cgg ata agt tca agt gct cca tca gat ttg ttg cca     2640
      Lys Leu Cys Asp Arg Ile Ser Ser Ser Ala Pro Ser Asp Leu Leu Pro
      865                 870                 875                 880
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      cgt caa att agc att gat tat gat gat gat gaa gag cac ttt ggg ctt     2688
      Arg Gln Ile Ser Ile Asp Tyr Asp Asp Asp Glu Glu His Phe Gly Leu
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 65   aat ttt gtc ctg ttc ggt tca aat aag aaa agg cat tcc ggt aaa cac     2736
      Asn Phe Val Leu Phe Gly Ser Asn Lys Lys Arg His Ser Gly Lys His
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5

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             915                 920                 925

5    gat aca ttt cat cta aga cac ttg agg ctt ctt aga acc ttg cac ctg    2832
     Asp Thr Phe His Leu Arg His Leu Arg Leu Leu Arg Thr Leu His Leu
             930                 935                 940

     gaa tcc tct ttt atc atg gtt aaa gat tct ttg ctg aat gaa ata tgc    2880
10   Glu Ser Ser Phe Ile Met Val Lys Asp Ser Leu Leu Asn Glu Ile Cys
     945                 950                 955                 960

     atg ttg aat cat ttg agg tac tta agc att ggg aca gaa gtt aaa tct    2928
15   Met Leu Asn His Leu Arg Tyr Leu Ser Ile Gly Thr Glu Val Lys Ser
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     ctg cct ttg tct ttc tca aac ctc tgg aat cta gaa atc ttg ttt gtg    2976
     Leu Pro Leu Ser Phe Ser Asn Leu Trp Asn Leu Glu Ile Leu Phe Val
                     980                 985                 990

20   gat aac aaa gaa tca acc ttg ata cta tta ccg aga att tgg gat ctt    3024
     Asp Asn Lys Glu Ser Thr Leu Ile Leu Leu Pro Arg Ile Trp Asp Leu
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25   gta aag ttg caa gtg ctg ttc acg act gct tgt tct ttc ttt gat       3069
     Val Lys Leu Gln Val Leu Phe Thr Thr Ala Cys Ser Phe Phe Asp
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     atg gat gca gat gaa tca ata ctg ata gca gag gac aca aag tta       3114
30   Met Asp Ala Asp Glu Ser Ile Leu Ile Ala Glu Asp Thr Lys Leu
             1025                1030                1035

     gag aac ttg aca gca tta ggg gaa ctc gtg ctt tcc tat tgg aaa       3159
35   Glu Asn Leu Thr Ala Leu Gly Glu Leu Val Leu Ser Tyr Trp Lys
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     gat aca gag gat att ttc aaa agg ctt ccc aat ctt caa gtg ctt       3204
     Asp Thr Glu Asp Ile Phe Lys Arg Leu Pro Asn Leu Gln Val Leu
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     His Phe Lys Leu Lys Glu Ser Trp Asp Tyr Ser Thr Glu Gln Tyr
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45   tgg ttc ccg aaa ttg gat ttc cta act gaa cta gaa aaa ctc act       3294
     Trp Phe Pro Lys Leu Asp Phe Leu Thr Glu Leu Glu Lys Leu Thr
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     gta gat ttt gaa aga tca aac aca aat gac agt ggg tcc tct gca       3339
50   Val Asp Phe Glu Arg Ser Asn Thr Asn Asp Ser Gly Ser Ser Ala
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     gcc ata aat cgg cca tgg gat ttt cac ttt cct tcg agt ttg aaa       3384
     Ala Ile Asn Arg Pro Trp Asp Phe His Phe Pro Ser Ser Leu Lys
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     aga ttg caa ttg cat gaa ttt cct ctg aca tcc gat tca cta tca       3429
     Arg Leu Gln Leu His Glu Phe Pro Leu Thr Ser Asp Ser Leu Ser
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60   aca ata gcg aga ctg ctg aac ctt gaa gag ttg tac ctt tat cgt       3474
     Thr Ile Ala Arg Leu Leu Asn Leu Glu Glu Leu Tyr Leu Tyr Arg
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65   aca atc atc cat ggg gaa gaa tgg aac atg gga gaa gaa gac acc       3519
     Thr Ile Ile His Gly Glu Glu Trp Asn Met Gly Glu Glu Asp Thr
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6

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aag tgg gag gtt gga gag gaa tct ttt ccc acg ctt gag aaa tta    3609
Lys Trp Glu Val Gly Glu Glu Ser Phe Pro Thr Leu Glu Lys Leu
    1190            1195            1200

gaa ctg tcg gac tgt cat aat ctt gag gag att ccg tct agt ttt    3654
Glu Leu Ser Asp Cys His Asn Leu Glu Glu Ile Pro Ser Ser Phe
    1205            1210            1215

ggg gat att tat tcc ttg aaa att atc gaa ctt gta agg agc cct    3699
Gly Asp Ile Tyr Ser Leu Lys Ile Ile Glu Leu Val Arg Ser Pro
    1220            1225            1230

caa ctt gaa aat tcc gct ctc aag att aag gaa tat gct gaa gat    3744
Gln Leu Glu Asn Ser Ala Leu Lys Ile Lys Glu Tyr Ala Glu Asp
    1235            1240            1245

atg agg gga ggg gac gag ctt cag atc ctt ggc cag aag gat atc    3789
Met Arg Gly Gly Asp Glu Leu Gln Ile Leu Gly Gln Lys Asp Ile
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Pro Leu Phe Lys
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<211> 1267

<212> PRT

<213> Solanum bulbocastanum


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Arg Leu Lys Asn Glu Glu Asp Gln Lys Ala Val Asp Val Asp Leu Ile
        35              40              45

Glu Ser Leu Lys Leu Lys Leu Thr Phe Ile Cys Thr Tyr Val Gln Leu
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Ser Tyr Ser Asp Leu Glu Lys Phe Glu Asp Ile Met Thr Arg Lys Arg
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Gln Glu Val Glu Asn Leu Leu Gln Pro Ile Leu Asp Asp Asp Gly Lys
                85              90              95

Asp Val Gly Cys Lys Tyr Val Leu Thr Ser Leu Ala Gly Asn Met Asp
                100             105             110
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**7**

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5               Asp Glu Gln Leu Gly Phe Leu Leu Leu Asn Leu Ser His Leu Ser Lys
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10              His Arg Ala Glu Lys Met Phe Pro Gly Val Thr Gln Tyr Glu Val Leu
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                Gln Asn Val Cys Gly Asn Ile Arg Asp Phe His Gly Leu Ile Val Asn
15                              165                 170                 175

                Cys Cys Ile Lys His Glu Met Val Glu Asn Val Leu Ser Leu Phe Gln
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                    195                 200                 205

25              Glu Asp Ser Gln Leu Ser Glu Leu Asp Glu Asp Asp Gln Asn Asp Lys
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30              Asp Pro Gln Leu Phe Lys Leu Ala His Leu Leu Leu Lys Ile Val Pro
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                Thr Glu Leu Glu Val Met His Ile Cys Tyr Lys Thr Leu Lys Ala Ser
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                Thr Ser Thr Glu Ile Gly Arg Phe Ile Lys Lys Leu Leu Glu Thr Ser
                            260                 265                 270

40              Pro Asp Ile Leu Arg Glu Tyr Leu Ile His Leu Gln Glu His Met Ile
                            275                 280                 285

45              Thr Val Ile Thr Pro Asn Thr Ser Gly Ala Arg Asn Ile His Val Met
                            290                 295                 300

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                Ile His His Asp Lys Leu Phe Asp Leu Leu Ala Arg Val Val Ala Leu
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                Thr Arg Glu Val Ser Thr Leu Val Arg Asp Leu Glu Glu Lys Leu Arg
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60              Ile Lys Glu Ser Thr Asp Glu Thr Asn Cys Ala Thr Leu Lys Phe Leu
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                        420             425                 430

        Asp Leu Glu Phe Ile Arg Ser Phe Phe Ala Asn Ile Glu Gln Gly Leu
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        Tyr Lys Asp Leu Trp Glu Arg Val Leu Asp Val Ala Tyr Glu Ala Lys
            450             455             460

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        Asp Val Ile Asp Ser Ile Ile Val Arg Asp Asn Gly Leu Leu His Leu
        465             470             475                     480

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        Ile Phe Ser Leu Pro Ile Thr Arg Lys Lys Met Met Leu Ile Lys Glu
                    485             490                 495

30      Glu Val Ser Asp Leu His Glu Asn Ile Ser Lys Asn Arg Gly Leu Ile
                    500             505             510

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35              515             520             525

        Asp Lys Ile Ile Val Gly Phe Gly Glu Glu Thr Asn Leu Ile Leu Arg
            530             535             540

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        Lys Leu Thr Ser Gly Pro Ala Asp Leu Asp Val Ile Ser Ile Ile Gly
        545             550             555                     560

45

        Met Pro Gly Leu Gly Lys Thr Thr Leu Ala Tyr Lys Val Tyr Asn Asp
                        565             570                 575

50      Lys Ser Val Ser Ser His Phe Asp Leu Arg Ala Trp Cys Thr Val Asp
                    580             585             590

        Gln Val Tyr Asp Glu Lys Lys Leu Leu Asp Lys Ile Phe Asn Gln Val
55              595             600             605

        Ser Asp Ser Asn Ser Lys Leu Ser Glu Asn Ile Asp Val Ala Asp Lys
            610             615             620

60

        Leu Arg Lys Gln Leu Phe Gly Lys Arg Tyr Leu Ile Val Leu Asp Asp
        625             630             635                     640

65

        Val Trp Asp Thr Asn Thr Trp Asp Glu Leu Thr Arg Pro Phe Pro Asp
                        645             650                 655
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     Gly Met Lys Gly Ser Arg Ile Ile Leu Thr Thr Arg Glu Lys Lys Val
             660             665             670

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             675             680             685

10   Arg Ser Glu Glu Ser Trp Glu Leu Leu Glu Lys Arg Ala Phe Gly Asn
             690             695             700

     Glu Ser Cys Pro Asp Glu Leu Leu Asp Val Gly Lys Glu Ile Ala Glu
15   705             710             715             720

     Asn Cys Lys Gly Leu Pro Leu Val Val Asp Leu Ile Ala Gly Ile Ile
                     725             730             735
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     Ala Gly Arg Glu Lys Lys Lys Ser Val Trp Leu Glu Val Val Asn Asn
             740             745             750

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     Leu His Ser Phe Ile Leu Lys Asn Glu Val Glu Val Met Lys Val Ile
             755             760             765

30   Glu Ile Ser Tyr Asp His Leu Pro Asp His Leu Lys Pro Cys Leu Leu
             770             775             780

     Tyr Phe Ala Ser Ala Pro Lys Asp Trp Val Thr Thr Ile His Glu Leu
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     Lys Leu Ile Trp Gly Phe Glu Gly Phe Val Glu Lys Thr Asp Met Lys
                     805             810             815
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     Ser Leu Glu Glu Val Val Lys Ile Tyr Leu Asp Asp Leu Ile Ser Ser
             820             825             830

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     Ser Leu Val Ile Cys Phe Asn Glu Ile Gly Asp Tyr Pro Thr Cys Gln
             835             840             845

50   Leu His Asp Leu Val His Asp Phe Cys Leu Ile Lys Ala Arg Lys Glu
         850             855             860

     Lys Leu Cys Asp Arg Ile Ser Ser Ser Ala Pro Ser Asp Leu Leu Pro
55   865             870             875             880

     Arg Gln Ile Ser Ile Asp Tyr Asp Asp Glu Glu His Phe Gly Leu
                     885             890             895
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     Asn Phe Val Leu Phe Gly Ser Asn Lys Lys Arg His Ser Gly Lys His
                     900             905             910

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     Leu Tyr Ser Leu Thr Ile Asn Gly Asp Glu Leu Asp Asp His Leu Ser
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Asp Thr Phe His Leu Arg His Leu Arg Leu Leu Arg Thr Leu His Leu
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Glu Ser Ser Phe Ile Met Val Lys Asp Ser Leu Leu Asn Glu Ile Cys
945               950                   955                   960

10  Met Leu Asn His Leu Arg Tyr Leu Ser Ile Gly Thr Glu Val Lys Ser
                    965               970                   975

Leu Pro Leu Ser Phe Ser Asn Leu Trp Asn Leu Glu Ile Leu Phe Val
            980               985                   990

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Asp Asn Lys Glu Ser Thr Leu Ile Leu Leu Pro Arg Ile Trp Asp Leu
        995               1000                1005

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Val Lys Leu Gln Val Leu Phe Thr Thr Ala Cys Ser Phe Phe Asp
    1010            1015                1020

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Met Asp Ala Asp Glu Ser Ile Leu Ile Ala Glu Asp Thr Lys Leu
    1025            1030                1035

30  Glu Asn Leu Thr Ala Leu Gly Glu Leu Val Leu Ser Tyr Trp Lys
        1040            1045                1050

Asp Thr Glu Asp Ile Phe Lys Arg Leu Pro Asn Leu Gln Val Leu
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His Phe Lys Leu Lys Glu Ser Trp Asp Tyr Ser Thr Glu Gln Tyr
    1070            1075                1080

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Trp Phe Pro Lys Leu Asp Phe Leu Thr Glu Leu Glu Lys Leu Thr
    1085            1090                1095

45

Val Asp Phe Glu Arg Ser Asn Thr Asn Asp Ser Gly Ser Ser Ala
    1100            1105                1110

50  Ala Ile Asn Arg Pro Trp Asp Phe His Phe Pro Ser Ser Leu Lys
    1115            1120                1125

Arg Leu Gln Leu His Glu Phe Pro Leu Thr Ser Asp Ser Leu Ser
    1130            1135                1140

55

Thr Ile Ala Arg Leu Leu Asn Leu Glu Glu Leu Tyr Leu Tyr Arg
    1145            1150                1155

60

Thr Ile Ile His Gly Glu Glu Trp Asn Met Gly Glu Glu Asp Thr
    1160            1165                1170

65

Phe Glu Asn Leu Lys Cys Leu Met Leu Ser Gln Val Ile Leu Ser
    1175            1180                1185

```
Lys Trp Glu Val Gly Glu Glu Ser Phe Pro Thr Leu Glu Lys Leu
    1190            1195            1200
```

```
Glu Leu Ser Asp Cys His Asn Leu Glu Glu Ile Pro Ser Ser Phe
    1205            1210            1215
```

```
Gly Asp Ile Tyr Ser Leu Lys Ile Ile Glu Leu Val Arg Ser Pro
    1220            1225            1230
```

```
Gln Leu Glu Asn Ser Ala Leu Lys Ile Lys Glu Tyr Ala Glu Asp
    1235            1240            1245
```

```
Met Arg Gly Gly Asp Glu Leu Gln Ile Leu Gly Gln Lys Asp Ile
    1250            1255            1260
```

```
Pro Leu Phe Lys
    1265
```

<210> 3

<211> 3890

<212> DNA

<213> Solanum bulbocastanum


<220>

<221> gene

<222> (1)..(3890)

<223> Coding nucleic acid sequence of the Rpi-blb2 gene including the intron sequence (position 43-128).


<220>

<221> Intron

<222> (43)..(128)

<223> Coding nucleic acid sequence of the Rpi-blb2 gene including the intron sequence (position 43-128).


<400> 3
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tttggcagga gtcattttct gctcttcgca aggatgctgc caatgttctg gatttcctag     180

agagattaaa gaatgaagaa gatcaaaagg ctgttgatgt ggatctgatt gaaagcctga     240

aattgaagct gacatttatt tgtacatatg tccagctttc ttattccgat ttggagaagt     300
```

```
      ttgaagatat aatgactaga aaaagacaag aggttgagaa tctgcttcaa ccaattttgg    360

      atgatgatgg caaagacgtc gggtgtaaat atgtccttac tagcctcgcc ggtaatatgg    420

 5    atgactgtat aagcttgtat catcgttcta aatcagatgc caccatgatg gatgagcaat    480

      tgggcttcct cctcttgaat ctctctcatc tatccaagca tcgtgctgaa aagatgtttc    540

      ctggagtgac tcaatatgag gttcttcaga atgtatgtgg caacataaga gatttccatg    600

10    gattgatagt gaattgttgc attaagcatg agatggttga gaatgtctta tctctgtttc    660

      aactgatggc tgagagagta ggacgcttcc tttgggagga tcaggctgat gaagactctc    720

15    aactctccga gctagatgag gatgatcaga atgataaaga ccctcaactc ttcaagctag    780

      cacatctact cttgaagatt gttccaactg aattggaggt tatgcacata tgttataaaa    840

      ctttgaaagc ttcaacttca acagaaattg gacgcttcat taagaagctc ctggaaacct    900

20    ctccggacat tctcagagaa tatctgattc atctacaaga gcatatgata actgttatta    960

      cccctaacac ttcaggggct cgaaacattc atgtcatgat ggaattccta ttgattattc   1020

25    tttctgatat gccgcccaag gactttattc atcatgacaa acttttttgat ctcttggctc   1080

      gtgttgtagc acttaccagg gaggtatcaa ctcttgtacg cgacttggaa gagaaattaa   1140

      ggattaaaga gagtactgac gaaacaaatt gtgcaaccct aaagtttctg gaaaatattg   1200

30    aactccttaa ggaagatctc aaacatgttt atctgaaagt cccggattca tctcaatatt   1260

      gcttccccat gagtgatgga cctctcttca tgcatctgct acagagacac ttagatgatt   1320

35    tgctggattc caatgcttat tcaattgctt tgataaagga acaaattggg ctggtgaaag   1380

      aagacttgga attcataaga tcttttttcg cgaatattga gcaaggattg tataaagatc   1440

      tctgggaacg tgttctagat gtggcatatg aggcaaaaga tgtcatagat tcaattattg   1500

40    ttcgagataa tggtctctta catcttattt tctcacttcc cattaccaga aagaagatga   1560

      tgcttatcaa agaagaggtc tctgatttac atgagaacat ttccaagaac agaggtctca   1620

45    tcgttgtgaa ctctcccaag aaaccagttg agagcaagtc attgacaact gataaaataa   1680

      ttgtaggttt tggtgaggag acaaacttga tacttagaaa gctcaccagt ggaccggcag   1740

50    atctagatgt catttcgatc attggtatgc cgggtttagg taaaactact ttggcgtaca   1800

      aagtatacaa tgataaatca gtttctagcc atttcgacct tcgtgcatgg tgcacggtcg   1860

      accaagtata tgacgagaag aagttgttgg ataaaatttt caatcaagtt agtgactcaa   1920

55    attcaaaatt gagtgagaat attgatgttg ctgataaact acggaaacaa ttgtttggaa   1980

      agaggtatct tattgtctta gatgacgtgt gggatactaa tacatgggat gagctaacaa   2040

      gaccttttcc tgatggtatg aaaggaagta gaattatttt gacaactcga gaaaagaaag   2100

60    ttgctttgca tggaaagctc tacactgatc ctcttaacct tcgattgcta agatcagaag   2160

      aaagttggga gttattagag aaaagggcat ttggaaacga gagttgccct gatgaactat   2220

65    tggatgttgg taaagaaata gccgaaaatt gtaaagggct cctttggtg gtggatctga   2280

      ttgctggaat cattgctggg agggaaaaga aaaagagtgt gtggcttgaa gttgtaaata   2340
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atttgcattc ctttattttg aagaatgaag tggaagtgat gaaagttata gaaataagtt   2400

atgaccactt acctgatcac ctgaagccat gcttgctgta ctttgcaagt gcgccgaagg   2460

actgggtaac gacaatccat gagttgaaac ttatttgggg ttttgaagga tttgtggaaa   2520

agacagatat gaagagtctg gaagaagtgg tgaaaattta tttggatgat ttaatttcca   2580

gtagcttggt aatttgtttc aatgagatag gtgattaccc tacttgccaa cttcatgatc   2640

ttgtgcatga cttttgtttg ataaaagcaa gaaaggaaaa gttgtgtgat cggataagtt   2700

caagtgctcc atcagatttg ttgccacgtc aaattagcat tgattatgat gatgatgaag   2760

agcactttgg gcttaatttt gtcctgttcg gttcaaataa gaaaaggcat tccggtaaac   2820

acctctattc tttgaccata aatggagatg agctggacga ccatctttct gatacatttc   2880

atctaagaca cttgaggctt cttagaacct tgcacctgga atcctctttt atcatggtta   2940

aagattcttt gctgaatgaa atatgcatgt tgaatcattt gaggtactta agcattggga   3000

cagaagttaa atctctgcct ttgtctttct caaacctctg gaatctagaa atcttgtttg   3060

tggataacaa agaatcaacc ttgatactat taccgagaat ttgggatctt gtaaagttgc   3120

aagtgctgtt cacgactgct tgttctttct ttgatatgga tgcagatgaa tcaatactga   3180

tagcagagga cacaaagtta gagaacttga cagcattagg ggaactcgtg ctttcctatt   3240

ggaaagatac agaggatatt ttcaaaaggc ttcccaatct tcaagtgctt catttcaaac   3300

tcaaggagtc atgggattat tcaacagagc aatattggtt cccgaaattg gatttcctaa   3360

ctgaactaga aaaactcact gtagattttg aaagatcaaa cacaaatgac agtgggtcct   3420

ctgcagccat aaatcggcca tgggattttc actttccttc gagtttgaaa agattgcaat   3480

tgcatgaatt tcctctgaca tccgattcac tatcaacaat agcgagactg ctgaaccttg   3540

aagagttgta cctttatcgt acaatcatcc atggggaaga atggaacatg ggagaagaag   3600

acacctttga gaatctcaaa tgtttgatgt tgagtcaagt gattctttcc aagtgggagg   3660

ttggagagga atcttttccc acgcttgaga aattagaact gtcggactgt cataatcttg   3720

aggagattcc gtctagtttt ggggatattt attccttgaa aattatcgaa cttgtaagga   3780

gccctcaact tgaaaattcc gctctcaaga ttaaggaata tgctgaagat atgagggggag   3840

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<210>    4

<211>    1267

<212>    PRT

<213>    Solanum bulbocastanum


<220>

<221>    protein

<222>    (1)..(1267)

&lt;223&gt;  Deduced Rpi-blb2 protein sequence

5

&lt;400&gt;  4

Met Glu Lys Arg Lys Asp Asn Glu Glu Ala Asn Asn Ser Leu Glu Ser
1               5                   10                  15

10

Phe Ser Ala Leu Arg Lys Asp Ala Ala Asn Val Leu Asp Phe Leu Glu
            20                  25                  30

15

Arg Leu Lys Asn Glu Glu Asp Gln Lys Ala Val Asp Val Asp Leu Ile
        35                  40                  45

20   Glu Ser Leu Lys Leu Lys Leu Thr Phe Ile Cys Thr Tyr Val Gln Leu
         50                  55                  60

Ser Tyr Ser Asp Leu Glu Lys Phe Glu Asp Ile Met Thr Arg Lys Arg
25  65                  70                  75                  80

Gln Glu Val Glu Asn Leu Leu Gln Pro Ile Leu Asp Asp Asp Gly Lys
                85                  90                  95

30

Asp Val Gly Cys Lys Tyr Val Leu Thr Ser Leu Ala Gly Asn Met Asp
            100                 105                 110

35

Asp Cys Ile Ser Leu Tyr His Arg Ser Lys Ser Asp Ala Thr Met Met
        115                 120                 125

40   Asp Glu Gln Leu Gly Phe Leu Leu Leu Asn Leu Ser His Leu Ser Lys
         130                 135                 140

His Arg Ala Glu Lys Met Phe Pro Gly Val Thr Gln Tyr Glu Val Leu
45  145                 150                 155                 160

Gln Asn Val Cys Gly Asn Ile Arg Asp Phe His Gly Leu Ile Val Asn
                165                 170                 175

50

Cys Cys Ile Lys His Glu Met Val Glu Asn Val Leu Ser Leu Phe Gln
            180                 185                 190

55

Leu Met Ala Glu Arg Val Gly Arg Phe Leu Trp Glu Asp Gln Ala Asp
        195                 200                 205

60   Glu Asp Ser Gln Leu Ser Glu Leu Asp Glu Asp Asp Gln Asn Asp Lys
         210                 215                 220

Asp Pro Gln Leu Phe Lys Leu Ala His Leu Leu Leu Lys Ile Val Pro
65  225                 230                 235                 240

Thr Glu Leu Glu Val Met His Ile Cys Tyr Lys Thr Leu Lys Ala Ser

**15**

                              245                    250                        255


5      Thr Ser Thr Glu Ile Gly Arg Phe Ile Lys Lys Leu Leu Glu Thr Ser
                     260              265              270


       Pro Asp Ile Leu Arg Glu Tyr Leu Ile His Leu Gln Glu His Met Ile
                 275              280              285

10

       Thr Val Ile Thr Pro Asn Thr Ser Gly Ala Arg Asn Ile His Val Met
                 290              295              300       .

15

       Met Glu Phe Leu Leu Ile Ile Leu Ser Asp Met Pro Pro Lys Asp Phe
       305                   310              315                   320


20     Ile His His Asp Lys Leu Phe Asp Leu Leu Ala Arg Val Val Ala Leu
                         325              330                   335


       Thr Arg Glu Val Ser Thr Leu Val Arg Asp Leu Glu Glu Lys Leu Arg
25                   340              345              350


       Ile Lys Glu Ser Thr Asp Glu Thr Asn Cys Ala Thr Leu Lys Phe Leu
                 355              360              365

30

       Glu Asn Ile Glu Leu Leu Lys Glu Asp Leu Lys His Val Tyr Leu Lys
                 370              375              380

35

       Val Pro Asp Ser Ser Gln Tyr Cys Phe Pro Met Ser Asp Gly Pro Leu
       385              390              395                   400


40     Phe Met His Leu Leu Gln Arg His Leu Asp Asp Leu Leu Asp Ser Asn
                     405              410              415


       Ala Tyr Ser Ile Ala Leu Ile Lys Glu Gln Ile Gly Leu Val Lys Glu
45                   420              425              430


       Asp Leu Glu Phe Ile Arg Ser Phe Phe Ala Asn Ile Glu Gln Gly Leu
                     435              440              445

50

       Tyr Lys Asp Leu Trp Glu Arg Val Leu Asp Val Ala Tyr Glu Ala Lys
                 450              455              460

55

       Asp Val Ile Asp Ser Ile Ile Val Arg Asp Asn Gly Leu Leu His Leu
       465              470              475              480


60     Ile Phe Ser Leu Pro Ile Thr Arg Lys Lys Met Met Leu Ile Lys Glu
                     485              490              495


       Glu Val Ser Asp Leu His Glu Asn Ile Ser Lys Asn Arg Gly Leu Ile
65                   500              505              510


       Val Val Asn Ser Pro Lys Lys Pro Val Glu Ser Lys Ser Leu Thr Thr

                    515                        520                        525

      Asp Lys Ile Ile Val Gly Phe Gly Glu Glu Thr Asn Leu Ile Leu Arg
5         530               535               540

      Lys Leu Thr Ser Gly Pro Ala Asp Leu Asp Val Ile Ser Ile Ile Gly
      545               550               555               560
10

      Met Pro Gly Leu Gly Lys Thr Thr Leu Ala Tyr Lys Val Tyr Asn Asp
                    565               570               575

15

      Lys Ser Val Ser Ser His Phe Asp Leu Arg Ala Trp Cys Thr Val Asp
                    580               585               590

20   Gln Val Tyr Asp Glu Lys Lys Leu Leu Asp Lys Ile Phe Asn Gln Val
                    595               600               605

      Ser Asp Ser Asn Ser Lys Leu Ser Glu Asn Ile Asp Val Ala Asp Lys
25        610               615               620

      Leu Arg Lys Gln Leu Phe Gly Lys Arg Tyr Leu Ile Val Leu Asp Asp
      625               630               635               640
30

      Val Trp Asp Thr Asn Thr Trp Asp Glu Leu Thr Arg Pro Phe Pro Asp
                    645               650               655

35

      Gly Met Lys Gly Ser Arg Ile Ile Leu Thr Thr Arg Glu Lys Lys Val
                    660               665               670

40   Ala Leu His Gly Lys Leu Tyr Thr Asp Pro Leu Asn Leu Arg Leu Leu
          675               680               685

      Arg Ser Glu Glu Ser Trp Glu Leu Leu Glu Lys Arg Ala Phe Gly Asn
45        690               695               700

      Glu Ser Cys Pro Asp Glu Leu Leu Asp Val Gly Lys Glu Ile Ala Glu
      705               710               715               720
50

      Asn Cys Lys Gly Leu Pro Leu Val Val Asp Leu Ile Ala Gly Ile Ile
                    725               730               735

55

      Ala Gly Arg Glu Lys Lys Lys Ser Val Trp Leu Glu Val Val Asn Asn
                    740               745               750

60   Leu His Ser Phe Ile Leu Lys Asn Glu Val Glu Val Met Lys Val Ile
              755               760               765

      Glu Ile Ser Tyr Asp His Leu Pro Asp His Leu Lys Pro Cys Leu Leu
65        770               775               780

      Tyr Phe Ala Ser Ala Pro Lys Asp Trp Val Thr Thr Ile His Glu Leu

```
        785                 790                 795                 800

5   Lys Leu Ile Trp Gly Phe Glu Gly Phe Val Glu Lys Thr Asp Met Lys
                    805                 810                 815


    Ser Leu Glu Glu Val Val Lys Ile Tyr Leu Asp Asp Leu Ile Ser Ser
                820                 825                 830
10


    Ser Leu Val Ile Cys Phe Asn Glu Ile Gly Asp Tyr Pro Thr Cys Gln
                835                 840                 845

15
    Leu His Asp Leu Val His Asp Phe Cys Leu Ile Lys Ala Arg Lys Glu
            850                 855                 860


20  Lys Leu Cys Asp Arg Ile Ser Ser Ser Ala Pro Ser Asp Leu Leu Pro
    865                 870                 875                 880


    Arg Gln Ile Ser Ile Asp Tyr Asp Asp Asp Glu Glu His Phe Gly Leu
25                  885                 890                 895


    Asn Phe Val Leu Phe Gly Ser Asn Lys Lys Arg His Ser Gly Lys His
                900                 905                 910
30


    Leu Tyr Ser Leu Thr Ile Asn Gly Asp Glu Leu Asp Asp His Leu Ser
            915                 920                 925

35
    Asp Thr Phe His Leu Arg His Leu Arg Leu Leu Arg Thr Leu His Leu
        930                 935                 940


40  Glu Ser Ser Phe Ile Met Val Lys Asp Ser Leu Leu Asn Glu Ile Cys
    945                 950                 955                 960


    Met Leu Asn His Leu Arg Tyr Leu Ser Ile Gly Thr Glu Val Lys Ser
45              965                 970                 975


    Leu Pro Leu Ser Phe Ser Asn Leu Trp Asn Leu Glu Ile Leu Phe Val
                980                 985                 990
50


    Asp Asn Lys Glu Ser Thr Leu Ile Leu Leu Pro Arg Ile Trp Asp Leu
                995                 1000                1005

55
    Val Lys Leu Gln Val Leu Phe Thr Thr Ala Cys Ser Phe Phe Asp
        1010                1015                1020


60  Met Asp Ala Asp Glu Ser Ile Leu Ile Ala Glu Asp Thr Lys Leu
        1025                1030                1035


    Glu Asn Leu Thr Ala Leu Gly Glu Leu Val Leu Ser Tyr Trp Lys
65      1040                1045                1050


    Asp Thr Glu Asp Ile Phe Lys Arg Leu Pro Asn Leu Gln Val Leu
```

**18**

```
            1055                    1060                    1065

 5      His Phe Lys Leu Lys Glu Ser  Trp Asp Tyr Ser Thr  Glu Gln Tyr
            1070                1075            1080


        Trp Phe Pro Lys Leu Asp Phe  Leu Thr Glu Leu Glu  Lys Leu Thr
10          1085                1090            1095


        Val Asp Phe Glu Arg Ser Asn  Thr Asn Asp Ser Gly  Ser Ser Ala
            1100                1105            1110

15
        Ala Ile Asn Arg Pro Trp Asp  Phe His Phe Pro Ser  Ser Leu Lys
            1115                1120            1125


20      Arg Leu Gln Leu His Glu Phe  Pro Leu Thr Ser Asp  Ser Leu Ser
            1130                1135            1140


        Thr Ile Ala Arg Leu Leu Asn  Leu Glu Glu Leu Tyr  Leu Tyr Arg
25          1145                1150            1155


        Thr Ile Ile His Gly Glu Glu  Trp Asn Met Gly Glu  Glu Asp Thr
            1160                1165            1170
30

        Phe Glu Asn Leu Lys Cys Leu  Met Leu Ser Gln Val  Ile Leu Ser
            1175                1180            1185

35
        Lys Trp Glu Val Gly Glu Glu  Ser Phe Pro Thr Leu  Glu Lys Leu
            1190                1195            1200


40      Glu Leu Ser Asp Cys His Asn  Leu Glu Glu Ile Pro  Ser Ser Phe
            1205                1210            1215


        Gly Asp Ile Tyr Ser Leu Lys  Ile Ile Glu Leu Val  Arg Ser Pro
45          1220                1225            1230


        Gln Leu Glu Asn Ser Ala Leu  Lys Ile Lys Glu Tyr  Ala Glu Asp
            1235                1240            1245
50

        Met Arg Gly Gly Asp Glu Leu  Gln Ile Leu Gly Gln  Lys Asp Ile
            1250                1255            1260

55
        Pro Leu Phe Lys
            1265


60      <210>  5

        <211>  7967

        <212>  DNA
65
        <213>  Solanum bulbocastanum
```

<220>

<221> genomic_DNA_fragment

<222> (1)..(7967)

<223> Sequence of the 7967 bp Sau3AI genomic DNA fragment of ARD 1197-1
6 BAC 211 present in p211F-C12, Rpi-blb2 gene including natural r
egulatory elements necessary for correct expression of the gene.
The initiation codon (ATG position 1546-1548) and the termination
codon (TAG position 5433-5435)


<220>

<221> stop_codon

<222> (5433)..(5435)

<223> Sequence of the 7967 bp Sau3AI genomic DNA fragment of ARD 1197-1
6 BAC 211 present in p211F-C12, Rpi-blb2 gene including natural r
egulatory elements necessary for correct expression of the gene.
The initiation codon (ATG position 1546-1548) and the termination
codon (TAG position 5433-5435)


<220>

<221> start_codon

<222> (1546)..(1548)

<223> Sequence of the 7967 bp Sau3AI genomic DNA fragment of ARD 1197-1
6 BAC 211 present in p211F-C12, Rpi-blb2 gene including natural r
egulatory elements necessary for correct expression of the gene.
The initiation codon (ATG position 1546-1548) and the termination
codon (TAG position 5433-5435)


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ccactgattc ctcttcaatc gccattgcag attctctcga tctatgctca aaaaatcccg         120

agataaaacc ctagatctgc ttcaaatgct ctgataccat gtaatttcag tgaattctaa         180

ctaaacaatg gagagaatta actattttag aaagactgat tgaaggagaa gaagagagaa         240

aaattctata ttgaactcat gaaccaaaat gaatgaaaaa aataatgaga agaactatac         300

tattacaatc tatatatctc tatttatatt ctaatctgaa gcagttaatt taactgactc         360

taacaactag actgataggt gtacattttc tgttagtgca ctgcagtgca tttaactaac         420

tgcttaacat aaagaatgtt gttcgaactt cattcgaata gcttcaatga gaagcaaaca         480

tgtgtacctg taaagacaca cagtaaaagt gttaataatg aataaatatg aataaatcaa         540

ataataaatt aaaaataaaa acacatccaa ttaacattgg aggtcttgaa aatcgatggt         600

aattaacaaa gacccttgtg aaatttaagt ctgtaattga aaatttgagt ataggttagg         660

ggacatttga ctattttctc attttcttta tcttttttcct aatttgtggc agacaagtga         720

20

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     ggaggcccca ctgtaattga ttcatgcttt tgctttcttg acttttttgga acaatactat     780

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  5  ctaataacaa agcaagcaga ggatatatag tttcatcaac taaaaaggtt agtcaactca     900

     tctaatattt gctactctca tctctattga agtacagtta tggaaaagta gaagtgatgt     960

     aagaaaaatg aaagaacttt agtaggttag ttggatctaa caaagagaaa gggaaataaa    1020

 10  ttgcaggaga aagagagagg ttaaatactt actcacacca ccgatttaca acaaatcact    1080

     taattgtggt tagttaatgt atactttcac ctcattaaat tattacttac ccatgataag    1140

 15  ttgtattaat ttggtattaa tatccggtgc gggtgaattc ttaccgggtg agagggatgg    1200

     ggttggagag tgtggagtga acagaagcag atgtttttaga ttttttctaa gatgacgaaa    1260

     gattcccctc actaatgaaa atatattact atacgctatt agagatagaa aggttcggta    1320

 20  ccagttggtc tcgtttctgg atgaaccdca tttttacaag tcattttctt caattcaaat    1380

     cgcaagtgta cctttatcat cttccactaa ttaagtcctc ttaagttcgc gtgaaaatag    1440

 25  tgaaattatt gattattctt atcatttcat cttctttctc ctgataaagt tttatgtact    1500

     ttttatgcat caggtcttga gaacttggaa aggaaaagta gaatcatgga aaaacgaaaa    1560

 30  gataatgaag aagcaaacaa ctcattggta tgttatttga tagagtgaac tgtaaagtat    1620

     tgaattgtag atatcatgtg gctttaaaaa tttgatatgt gttatttttgg caggagtcat    1680

     tttctgctct tcgcaaggat gctgccaatg ttctggattt cctagagaga ttaaagaatg    1740

 35  aagaagatca aaaggctgtt gatgtggatc tgattgaaag cctgaaattg aagctgacat    1800

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 40  ctagaaaaag acaagaggtt gagaatctgc ttcaaccaat tttggatgat gatggcaaag    1920

     acgtcgggtg taaatatgtc cttactagcc tcgccggtaa tatggatgac tgtataagct    1980

     tgtatcatcg ttctaaatca gatgccacca tgatggatga gcaattgggc ttcctcctct    2040

 45  tgaatctctc tcatctatcc aagcatcgtg ctgaaaagat gtttcctgga gtgactcaat    2100

     atgaggttct tcagaatgta tgtggcaaca taagagattt ccatggattg atagtgaatt    2160

 50  gttgcattaa gcatgagatg gttgagaatg tcttatctct gtttcaactg atggctgaga    2220

     gagtaggacg cttcctttgg gaggatcagg ctgatgaaga ctctcaactc tccgagctag    2280

     atgaggatga tcagaatgat aaagaccctc aactcttcaa gctagcacat ctactcttga    2340

 55  agattgttcc aactgaattg gaggttatgc acatatgtta taaaactttg aaagcttcaa    2400

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 60  gagaatatct gattcatcta caagagcata tgataactgt tattaccccct aacacttcag    2520

     gggctcgaaa cattcatgtc atgatggaat cctattgat tattctttct gatatgccgc    2580

     ccaaggactt tattcatcat gacaaacttt ttgatctctt ggctcgtgtt gtagcactta    2640

 65  ccagggaggt atcaactctt gtacgcgact tggaagagaa attaaggatt aaagagagta    2700

     ctgacgaaac aaattgtgca accctaaagt ttctggaaaa tattgaactc cttaaggaag    2760
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      atctcaaaca tgtttatctg aaagtcccgg attcatctca atattgcttc cccatgagtg   2820

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26

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65   ctgacaatct ccacaagtct tagtcaactt gtaatatgaa tattagccag gtagacgtac    7380

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gtttctttat tattaaatta gtttataata actaaactaa ggtaataaga ccttagttta   8460

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      atgagtcaca ataaggtagt ttaactttcc aactaacctt ttgtatctct atggatcatt    9720

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      1               5                   10                  15

      ttt tct gct ctt agc aag gac att gcc gat gtt ctg gtt ttc cta gag      96
45    Phe Ser Ala Leu Ser Lys Asp Ile Ala Asp Val Leu Val Phe Leu Glu
                  20                  25                  30

      aat gag gaa aat caa aaa gct ctt gac aaa gat caa gtt gaa aag ata     144
      Asn Glu Glu Asn Gln Lys Ala Leu Asp Lys Asp Gln Val Glu Lys Ile
                  35                  40                  45
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      aaa ttg aaa atg gca ttt att tgt aca tat gtt cag ctt tct tgt tcc     192
      Lys Leu Lys Met Ala Phe Ile Cys Thr Tyr Val Gln Leu Ser Cys Ser
                  50                  55                  60

55    gat ttt gag cag ttt gaa gat ata atg act aga aaa aga caa gag gtt     240
      Asp Phe Glu Gln Phe Glu Asp Ile Met Thr Arg Lys Arg Gln Glu Val
      65                  70                  75                  80

      gag aat ctg ctt caa cca ctt ttg gat gat gat gtc ttt act agc ctc     288
60    Glu Asn Leu Leu Gln Pro Leu Leu Asp Asp Asp Val Phe Thr Ser Leu
                      85                  90                  95

      acc agt aat atg gat gac tgt atc agc ttg tat cat cgt tct tat aaa     336
      Thr Ser Asn Met Asp Asp Cys Ile Ser Leu Tyr His Arg Ser Tyr Lys
65                100                 105                 110

      tca gat gcc atc atg atg gat gag caa ttg gac ttc ctc ctc ttg aat     384
      Ser Asp Ala Ile Met Met Asp Glu Gln Leu Asp Phe Leu Leu Leu Asn
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**30**

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     ctc tat cat cta tcc aag cat cac gct gaa aag ata ttt cct gga gtg      432
     Leu Tyr His Leu Ser Lys His His Ala Glu Lys Ile Phe Pro Gly Val
5        130                    135                    140

     act caa tat gaa gtt ctt cag aat ata tgt ggc aac ata aga gat ttc      480
     Thr Gln Tyr Glu Val Leu Gln Asn Ile Cys Gly Asn Ile Arg Asp Phe
     145                    150                    155                    160
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     cat ggg ttg ata gtg aat ggt tgc att aag cat gag atg gtt gag aat      528
     His Gly Leu Ile Val Asn Gly Cys Ile Lys His Glu Met Val Glu Asn
                            165                    170                    175

15   gtc ttr cct ctg ttt caa ctc atg gct gac aga gta gga cac ttc ctt      576
     Val Xaa Pro Leu Phe Gln Leu Met Ala Asp Arg Val Gly His Phe Leu
                        180                    185                    190

     tgg gat gat cag act gat gaa gac tct cga ctc tcc gag cta gat gag      624
20·  Trp Asp Asp Gln Thr Asp Glu Asp Ser Arg Leu Ser Glu Leu Asp Glu
                    195                    200                    205

     gat gaa caa aat gat aga gac tct cga ctt ttc aag cta gca cat cta      672
     Asp Glu Gln Asn Asp Arg Asp Ser Arg Leu Phe Lys Leu Ala His Leu
25       210                    215                    220

     ctc ttg aag atc gtt ccg gtt gaa ctg gag gtt ata cac ata tgt tat      720
     Leu Leu Lys Ile Val Pro Val Glu Leu Glu Val Ile His Ile Cys Tyr
     225                    230                    235                    240
30

     aca aac ttg aaa gct tca act tca gct gaa gtt gga ctc ttc att aag      768
     Thr Asn Leu Lys Ala Ser Thr Ser Ala Glu Val Gly Leu Phe Ile Lys
                        245                    250                    255

35   cag ctt cta gaa acc tct cca gat att ctg agg gaa tat cta att cct      816
     Gln Leu Leu Glu Thr Ser Pro Asp Ile Leu Arg Glu Tyr Leu Ile Pro
                        260                    265                    270

     ctg caa gag cac atg gta act gtt att acc cct agc act tca ggg gct      864
40   Leu Gln Glu His Met Val Thr Val Ile Thr Pro Ser Thr Ser Gly Ala
                    275                    280                    285

     cga aac att cat gtc atg atg gaa ttc cta tta ctt att ctt tct gat      912
     Arg Asn Ile His Val Met Met Glu Phe Leu Leu Leu Ile Leu Ser Asp
45       290                    295                    300

     atg ccc aag gac ttt att cat cat gac aaa ctt ttt gat ctc ttg gat      960·
     Met Pro Lys Asp Phe Ile His His Asp Lys Leu Phe Asp Leu Leu Asp
     305                    310                    315                    320
50

     cgt gtc gga gta ctt acc agg gag gta tca act ctt gta cgt gac ttg      1008
     Arg Val Gly Val Leu Thr Arg Glu Val Ser Thr Leu Val Arg Asp Leu
                        325                    330                    335

55   gaa gag gaa cca agg aat aaa gag ggt aat aac caa aca aat tgt gca      1056
     Glu Glu Glu Pro Arg Asn Lys Glu Gly Asn Asn Gln Thr Asn Cys Ala
                        340                    345                    350

     acc cta gac ttg ctg gaa aat att gaa ctc ctc aag aaa gat ctc aaa      1104
60   Thr Leu Asp Leu Leu Glu Asn Ile Glu Leu Leu Lys Lys Asp Leu Lys
                    355                    360                    365

     cat gtt tat ctg aaa gcc ctg gat tca tct caa tgt tgc ttc ccc atg      1152
     His Val Tyr Leu Lys Ala Leu Asp Ser Ser Gln Cys Cys Phe Pro Met
65       370                    375                    380

     agt gat gga cca ctc ttc atg cat ctt cta cac ata cac tta aat gat      1200
     Ser Asp Gly Pro Leu Phe Met His Leu Leu His Ile His Leu Asn Asp
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           385                    390                    395                    400
    ttg tta gat tct aat gct tat tca att gct ttg ata aag gaa gaa atc        1248
    Leu Leu Asp Ser Asn Ala Tyr Ser Ile Ala Leu Ile Lys Glu Glu Ile
5   .                       405             410                 415

    gag ctg gtg aag caa gac ctg aaa ttc ata aga tca ttc ttt gtg gat        1296
    Glu Leu Val Lys Gln Asp Leu Lys Phe Ile Arg Ser Phe Phe Val Asp
                    420             425             430
10

    gct gag caa gga ttg tat aaa gat ctc tgg gca cgt gtt cta gat gtg        1344
    Ala Glu Gln Gly Leu Tyr Lys Asp Leu Trp Ala Arg Val Leu Asp Val
                435             440             445
15  gct tat gag gca aaa gat gtc ata gat tca att att gtt cga gat aat        1392
    Ala Tyr Glu Ala Lys Asp Val Ile Asp Ser Ile Ile Val Arg Asp Asn
        450             455             460

    ggt ctc tta cat ctt att ttc tca ctt ccc att acc ata aag aag atc        1440
20  Gly Leu Leu His Leu Ile Phe Ser Leu Pro Ile Thr Ile Lys Lys Ile
    465             470             475             480

    aaa ctt atc aaa gaa gag atc tct gct tta gat gag aac att ccc aag        1488
    Lys Leu Ile Lys Glu Glu Ile Ser Ala Leu Asp Glu Asn Ile Pro Lys
25              .   485             490                 495

    gac aga ggt cta atc gtt gtg aac tct ccc aag aaa cca gtt gag aga        1536
    Asp Arg Gly Leu Ile Val Val Asn Ser Pro Lys Lys Pro Val Glu Arg
                500             505             510
30
    aag tca ttg aca act gat aaa ata act gta ggt ttt gag gag gaa aca        1584
    Lys Ser Leu Thr Thr Asp Lys Ile Thr Val Gly Phe Glu Glu Glu Thr
                515         .       520             525

35  aac ttg ata ctt aga aag ctc acc agt gga tcg gca gat cta gat gtc        1632
    Asn Leu Ile Leu Arg Lys Leu Thr Ser Gly Ser Ala Asp Leu Asp Val
        530             535             540

    att tcg atc act ggt atg ccg ggt tca ggt aaa act act ttg gca tac        1680
40  Ile Ser Ile Thr Gly Met Pro Gly Ser Gly Lys Thr Thr Leu Ala Tyr
    545                 550             555             560

    aaa gta tac aat gat aag tca gtt tct agc cgt ttc gac ctt cgt gca        1728
    Lys Val Tyr Asn Asp Lys Ser Val Ser Ser Arg Phe Asp Leu Arg Ala
45              565             570     .           575

    tgg tgc acg gtc gac caa gga tgt gat gag aag aag ttg ttg aat aca        1776
    Trp Cys Thr Val Asp Gln Gly Cys Asp Glu Lys Lys Leu Leu Asn Thr
                580             585             590
50
    att ttc agt caa gtt agt gac tca gat tca aaa ttg agt gag aat att        1824
    Ile Phe Ser Gln Val Ser Asp Ser Asp Ser Lys Leu Ser Glu Asn Ile
                595             600             605

55  gat gtt gct gat aaa tta cgg aaa caa ctg ttt gga aag agg tat ctt        1872
    Asp Val Ala Asp Lys Leu Arg Lys Gln Leu Phe Gly Lys Arg Tyr Leu
        610         .       615             620

    att gtc tta gat gac gtg tgg gat act act aca tgg gat gag tta aca        1920
60  Ile Val Leu Asp Asp Val Trp Asp Thr Thr Thr Trp Asp Glu Leu Thr
    625                 630             635             640

    aga cct ttt cct gaa tct aag aaa gga agt agg att att ttg aca act        1968
    Arg Pro Phe Pro Glu Ser Lys Lys Gly Ser Arg Ile Ile Leu Thr Thr
65              645             650             655

    cgg gaa aag gaa gtg gct ttg cat gga aag ctg aac act gat cct ctt        2016
    Arg Glu Lys Glu Val Ala Leu His Gly Lys Leu Asn Thr Asp Pro Leu
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              660                         665                          670

      gac ctt cga ttg cta aga cca gat gaa agt tgg gaa cta tta gag aaa      2064
      Asp Leu Arg Leu Leu Arg Pro Asp Glu Ser Trp Glu Leu Leu Glu Lys
5             675                     680                  685

      agg gca ttt ggg aat gag agt tgc cct gat gaa cta tta gat gtc ggt      2112
      Arg Ala Phe Gly Asn Glu Ser Cys Pro Asp Glu Leu Leu Asp Val Gly
10            690                     695                  700

      aaa gaa ata gcc gaa aat tgt aaa ggg ctt cct ttg gtg gct gat ctg      2160
      Lys Glu Ile Ala Glu Asn Cys Lys Gly Leu Pro Leu Val Ala Asp Leu
      705                 710                 715                  720

15    att gct gga gtc att gct ggg agg gaa aag aaa agg agt gtg tgg ctt      2208
      Ile Ala Gly Val Ile Ala Gly Arg Glu Lys Lys Arg Ser Val Trp Leu
                          725                 730                 735

      gaa gtt caa agt agt ttg agt tct ttt att ttg aac agt gaa gtg gaa      2256
20    Glu Val Gln Ser Ser Leu Ser Ser Phe Ile Leu Asn Ser Glu Val Glu
                      740                 745                 750

      gtg atg aaa gtt ata gaa tta agt tat gac cat tta cca cat cac ctc      2304
      Val Met Lys Val Ile Glu Leu Ser Tyr Asp His Leu Pro His His Leu
25                755                 760                 765

      aag cca tgc ttg ctg tat ttt gca agt ttt ccg aag gac act tca ttg      2352
      Lys Pro Cys Leu Leu Tyr Phe Ala Ser Phe Pro Lys Asp Thr Ser Leu
                  770                 775                 780
30

      aca atc tat gag ttg aat gtt tat ttc ggt gct gaa gga ttt gtg gga      2400
      Thr Ile Tyr Glu Leu Asn Val Tyr Phe Gly Ala Glu Gly Phe Val Gly
      785                 790                 795                  800

35    aag acg gag atg aac agt atg gaa gaa gtg gtg aag att tat atg gat      2448
      Lys Thr Glu Met Asn Ser Met Glu Glu Val Val Lys Ile Tyr Met Asp
                      805                 810                 815

      gat tta att tac agt agc ttg gta att tgt ttc aat gag ata ggt tat      2496
40    Asp Leu Ile Tyr Ser Ser Leu Val Ile Cys Phe Asn Glu Ile Gly Tyr
                      820                 825                 830

      gca ctg aat ttc caa att cat gat ctt gtg cat gac ttt tgt ttg ata      2544
      Ala Leu Asn Phe Gln Ile His Asp Leu Val His Asp Phe Cys Leu Ile
45                835                 840                 845

      aaa gca aga aag gaa aat ttg ttt gat cag ata aga tca agt gct cca      2592
      Lys Ala Arg Lys Glu Asn Leu Phe Asp Gln Ile Arg Ser Ser Ala Pro
          850                 855                 860
50
      tca gat ttg ttg cct cgt caa att acc att gat tgt gat gag gag gag      2640
      Ser Asp Leu Leu Pro Arg Gln Ile Thr Ile Asp Cys Asp Glu Glu Glu
      865                 870                 875                  880

55    cac ttt ggg ctt aat ttt gtc atg ttc gat tca aat aag aaa agg cat      2688
      His Phe Gly Leu Asn Phe Val Met Phe Asp Ser Asn Lys Lys Arg His
                          885                 890                 895

      tct ggt aaa cac ctc tat tct ttg agg ata att gga gac cag ctg gat      2736
60    Ser Gly Lys His Leu Tyr Ser Leu Arg Ile Ile Gly Asp Gln Leu Asp
                  900                 905                 910

      gac agt gtt tct gat gca ttt cac cta aga cac ttg agg ctt ctt aga      2784
      Asp Ser Val Ser Asp Ala Phe His Leu Arg His Leu Arg Leu Leu Arg
65            915                 920                 925

      gtg ttg gac ctg cat acg tct ttt atc atg gtg aaa gat tct ttg ctg      2832
      Val Leu Asp Leu His Thr Ser Phe Ile Met Val Lys Asp Ser Leu Leu
```

```
            930                   935                    940

    aat gaa ata tgc atg ttg aat cat ttg agg tac tta tcc att gac aca    2880
    Asn Glu Ile Cys Met Leu Asn His Leu Arg Tyr Leu Ser Ile Asp Thr
 5  945                   950                    955              960

    caa gtt aaa tat ctg cct ttg tct ttc tca aac ctc tgg aat cta gaa    2928
    Gln Val Lys Tyr Leu Pro Leu Ser Phe Ser Asn Leu Trp Asn Leu Glu
                        965                   970              975
10
    agc ctg ttt gtg tct acc aac aga tca atc ttg gta cta tta ccg aga    2976
    Ser Leu Phe Val Ser Thr Asn Arg Ser Ile Leu Val Leu Leu Pro Arg
                    980                   985              990

15  att ttg gat ctt gta aag ttg cga gtg ctg tcc gtg gat gct tgt tct    3024
    Ile Leu Asp Leu Val Lys Leu Arg Val Leu Ser Val Asp Ala Cys Ser
                995                  1000              1005

    ttc ttt gat atg gat gca gat gaa tca ata ttg ata gca gag gac       3069
20  Phe Phe Asp Met Asp Ala Asp Glu Ser Ile Leu Ile Ala Glu Asp
            1010              1015             1020

    aca aag tta gag aac ttg aga ata tta acg gaa ctg ttg att tcc       3114
25  Thr Lys Leu Glu Asn Leu Arg Ile Leu Thr Glu Leu Leu Ile Ser
        1025              1030             1035

    tat tcg aaa gat aca aag aat att ttc aaa agg ttt ccc aat ctt       3159
    Tyr Ser Lys Asp Thr Lys Asn Ile Phe Lys Arg Phe Pro Asn Leu
        1040              1045             1050
30
    cag ttg ctt tca ttt gaa ctc aag gag tca tgg gat tat tca aca       3204
    Gln Leu Leu Ser Phe Glu Leu Lys Glu Ser Trp Asp Tyr Ser Thr
        1055              1060             1065

35  gag caa cat tgg ttc tcg gaa ttg gat ttc cta act gaa cta gaa       3249
    Glu Gln His Trp Phe Ser Glu Leu Asp Phe Leu Thr Glu Leu Glu
        1070              1075             1080

    aca ctc tct gta ggt ttt aaa agt tca aac aca aac gat agt ggg       3294
40  Thr Leu Ser Val Gly Phe Lys Ser Ser Asn Thr Asn Asp Ser Gly
        1085              1090             1095

    tcc tct gta gcg aca aat cgg ccg tgg gat ttt cac ttc cct tca       3339
    Ser Ser Val Ala Thr Asn Arg Pro Trp Asp Phe His Phe Pro Ser
        1100              1105             1110
45
    aat ttg aaa ata ctg tgg ttg cgt gaa ttt ccg ctg aca tcc gat       3384
    Asn Leu Lys Ile Leu Trp Leu Arg Glu Phe Pro Leu Thr Ser Asp
        1115              1120             1125
50
    tca cta tca aca ata gcg aga ctg ccc aac ctt gaa gag ttg tcc       3429
    Ser Leu Ser Thr Ile Ala Arg Leu Pro Asn Leu Glu Glu Leu Ser
        1130              1135             1140

55  ctt tat cat aca atc atc cat gga gaa gaa tgg aac atg ggg gag       3474
    Leu Tyr His Thr Ile Ile His Gly Glu Glu Trp Asn Met Gly Glu
        1145              1150             1155

    gaa gac acc ttt gag aat ctc aaa ttt ttg aac ttc aat caa gtt       3519
60  Glu Asp Thr Phe Glu Asn Leu Lys Phe Leu Asn Phe Asn Gln Val
        1160              1165             1170

    agt att tcc aag tgg gag gtt gga gag gaa tcc ttc ccc aat ctt       3564
    Ser Ile Ser Lys Trp Glu Val Gly Glu Glu Ser Phe Pro Asn Leu
65      1175              1180             1185

    gag aaa tta aaa ctg cgg gga tgt cat aag cta gag gag att cca       3609
    Glu Lys Leu Lys Leu Arg Gly Cys His Lys Leu Glu Glu Ile Pro
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|  | 1190 | | | | 1195 | | | | | | 1200 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | cct<br>Pro<br>1205 | agt<br>Ser | ttt<br>Phe | gga<br>Gly | gat<br>Asp | att<br>Ile | tat<br>Tyr<br>1210 | tca<br>Ser | ttg<br>Leu | aaa<br>Lys | tct<br>Ser | atc<br>Ile<br>1215 | aaa<br>Lys | att<br>Ile | gta<br>Val | 3654 |

aag agt cct caa ctt gaa gat tct gct ctc aaa att aag gaa tac      3699
Lys Ser Pro Gln Leu Glu Asp Ser Ala Leu Lys Ile Lys Glu Tyr
    1220        1225            1230

10

gct gaa gat atg agg gga ggg gac gag ctt cag atc ctt ggc caa      3744
Ala Glu Asp Met Arg Gly Gly Asp Glu Leu Gln Ile Leu Gly Gln
    1235        1240            1245

15  aag aat atc ccc tta ttt aag tag                                 3768
    Lys Asn Ile Pro Leu Phe Lys
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    <222>  (178)..(178)
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    Phe Ser Ala Leu Ser Lys Asp Ile Ala Asp Val Leu Val Phe Leu Glu
45              20              25              30


    Asn Glu Glu Asn Gln Lys Ala Leu Asp Lys Asp Gln Val Glu Lys Ile
        35              40              45
50

    Lys Leu Lys Met Ala Phe Ile Cys Thr Tyr Val Gln Leu Ser Cys Ser
        50              55              60

55
    Asp Phe Glu Gln Phe Glu Asp Ile Met Thr Arg Lys Arg Gln Glu Val
    65              70              75              80


60  Glu Asn Leu Leu Gln Pro Leu Leu Asp Asp Asp Val Phe Thr Ser Leu
                85              90              95


    Thr Ser Asn Met Asp Asp Cys Ile Ser Leu Tyr His Arg Ser Tyr Lys
65              100             105             110


    Ser Asp Ala Ile Met Met Asp Glu Gln Leu Asp Phe Leu Leu Leu Asn

                    115                    120                    125

5       Leu Tyr His Leu Ser Lys His His Ala Glu Lys Ile Phe Pro Gly Val
            130                135                140


10      Thr Gln Tyr Glu Val Leu Gln Asn Ile Cys Gly Asn Ile Arg Asp Phe
        145                150                155                160


        His Gly Leu Ile Val Asn Gly Cys Ile Lys His Glu Met Val Glu Asn
                        165                170                175

15

        Val Xaa Pro Leu Phe Gln Leu Met Ala Asp Arg Val Gly His Phe Leu
                    180                185                190


20      Trp Asp Asp Gln Thr Asp Glu Asp Ser Arg Leu Ser Glu Leu Asp Glu
                    195                200                205


        Asp Glu Gln Asn Asp Arg Asp Ser Arg Leu Phe Lys Leu Ala His Leu
25          210                215                220


        Leu Leu Lys Ile Val Pro Val Glu Leu Glu Val Ile His Ile Cys Tyr
        225                230                235                240

30

        Thr Asn Leu Lys Ala Ser Thr Ser Ala Glu Val Gly Leu Phe Ile Lys
                        245                250                255

35

        Gln Leu Leu Glu Thr Ser Pro Asp Ile Leu Arg Glu Tyr Leu Ile Pro
                    260                265                270


40      Leu Gln Glu His Met Val Thr Val Ile Thr Pro Ser Thr Ser Gly Ala
                    275                280                285


        Arg Asn Ile His Val Met Met Glu Phe Leu Leu Leu Ile Leu Ser Asp
45          290                295                300


        Met Pro Lys Asp Phe Ile His His Asp Lys Leu Phe Asp Leu Leu Asp
        305                310                315                320

50

        Arg Val Gly Val Leu Thr Arg Glu Val Ser Thr Leu Val Arg Asp Leu
                        325                330                335

55

        Glu Glu Glu Pro Arg Asn Lys Glu Gly Asn Asn Gln Thr Asn Cys Ala
                    340                345                350


60      Thr Leu Asp Leu Leu Glu Asn Ile Glu Leu Leu Lys Lys Asp Leu Lys
            355                360                365


        His Val Tyr Leu Lys Ala Leu Asp Ser Ser Gln Cys Cys Phe Pro Met
65          370                375                380


        Ser Asp Gly Pro Leu Phe Met His Leu Leu His Ile His Leu Asn Asp

385                    390                    395                    400

5      Leu Leu Asp Ser Asn Ala Tyr Ser Ile Ala Leu Ile Lys Glu Glu Ile
                       405                    410                    415

       Glu Leu Val Lys Gln Asp Leu Lys Phe Ile Arg Ser Phe Phe Val Asp
10                     420                    425                    430

       Ala Glu Gln Gly Leu Tyr Lys Asp Leu Trp Ala Arg Val Leu Asp Val
                       435                    440                    445

15     Ala Tyr Glu Ala Lys Asp Val Ile Asp Ser Ile Ile Val Arg Asp Asn
                       450                    455                    460

20     Gly Leu Leu His Leu Ile Phe Ser Leu Pro Ile Thr Ile Lys Lys Ile
       465                    470                    475                    480

25     Lys Leu Ile Lys Glu Glu Ile Ser Ala Leu Asp Glu Asn Ile Pro Lys
                       485                    490                    495

       Asp Arg Gly Leu Ile Val Val Asn Ser Pro Lys Lys Pro Val Glu Arg
30                     500                    505                    510

       Lys Ser Leu Thr Thr Asp Lys Ile Thr Val Gly Phe Glu Glu Glu Thr
                       515                    520                    525

35     Asn Leu Ile Leu Arg Lys Leu Thr Ser Gly Ser Ala Asp Leu Asp Val
                       530                    535                    540

40     Ile Ser Ile Thr Gly Met Pro Gly Ser Gly Lys Thr Thr Leu Ala Tyr
       545                    550                    555                    560

45     Lys Val Tyr Asn Asp Lys Ser Val Ser Ser Arg Phe Asp Leu Arg Ala
                       565                    570                    575

       Trp Cys Thr Val Asp Gln Gly Cys Asp Glu Lys Lys Leu Leu Asn Thr
50                     580                    585                    590

       Ile Phe Ser Gln Val Ser Asp Ser Asp Ser Lys Leu Ser Glu Asn Ile
                       595                    600                    605

55     Asp Val Ala Asp Lys Leu Arg Lys Gln Leu Phe Gly Lys Arg Tyr Leu
       610                    615                    620

60     Ile Val Leu Asp Asp Val Trp Asp Thr Thr Thr Trp Asp Glu Leu Thr
       625                    630                    635                    640

65     Arg Pro Phe Pro Glu Ser Lys Lys Gly Ser Arg Ile Ile Leu Thr Thr
                       645                    650                    655

       Arg Glu Lys Glu Val Ala Leu His Gly Lys Leu Asn Thr Asp Pro Leu

                        660                    665                    670

5       Asp Leu Arg Leu Leu Arg Pro Asp Glu Ser Trp Glu Leu Leu Glu Lys
                    675                680                685

10      Arg Ala Phe Gly Asn Glu Ser Cys Pro Asp Glu Leu Leu Asp Val Gly
                690                695                700

15      Lys Glu Ile Ala Glu Asn Cys Lys Gly Leu Pro Leu Val Ala Asp Leu
        705                710                715                720

20      Ile Ala Gly Val Ile Ala Gly Arg Glu Lys Lys Arg Ser Val Trp Leu
                        725                730                735

25      Glu Val Gln Ser Ser Leu Ser Ser Phe Ile Leu Asn Ser Glu Val Glu
                    740                745                750

        Val Met Lys Val Ile Glu Leu Ser Tyr Asp His Leu Pro His His Leu
                    755                760                765

30      Lys Pro Cys Leu Leu Tyr Phe Ala Ser Phe Pro Lys Asp Thr Ser Leu
                770                775                780

35      Thr Ile Tyr Glu Leu Asn Val Tyr Phe Gly Ala Glu Gly Phe Val Gly
        785                790                795                800

40      Lys Thr Glu Met Asn Ser Met Glu Glu Val Val Lys Ile Tyr Met Asp
                        805                810                815

45      Asp Leu Ile Tyr Ser Ser Leu Val Ile Cys Phe Asn Glu Ile Gly Tyr
                    820                825                830

        Ala Leu Asn Phe Gln Ile His Asp Leu Val His Asp Phe Cys Leu Ile
                    835                840                845

50      Lys Ala Arg Lys Glu Asn Leu Phe Asp Gln Ile Arg Ser Ser Ala Pro
                850                855                860

55      Ser Asp Leu Leu Pro Arg Gln Ile Thr Ile Asp Cys Asp Glu Glu Glu
        865                870                875                880

        His Phe Gly Leu Asn Phe Val Met Phe Asp Ser Asn Lys Lys Arg His
                        885                890                895

60      Ser Gly Lys His Leu Tyr Ser Leu Arg Ile Ile Gly Asp Gln Leu Asp
                        900                905                910

65      Asp Ser Val Ser Asp Ala Phe His Leu Arg His Leu Arg Leu Leu Arg
                    915                920                925

        Val Leu Asp Leu His Thr Ser Phe Ile Met Val Lys Asp Ser Leu Leu

                    930                        935                        940


5    Asn Glu Ile Cys Met Leu Asn His Leu Arg Tyr Leu Ser Ile Asp Thr
     945                        950                        955                        960


     Gln Val Lys Tyr Leu Pro Leu Ser Phe Ser Asn Leu Trp Asn Leu Glu
10                             965                        970                        975


     Ser Leu Phe Val Ser Thr Asn Arg Ser Ile Leu Val Leu Leu Pro Arg
                               980                        985                        990

15
     Ile Leu Asp Leu Val Lys Leu Arg Val Leu Ser Val Asp Ala Cys Ser
                               995                        1000                       1005


20   Phe Phe Asp Met Asp Ala Asp Glu Ser Ile Leu Ile Ala Glu Asp
                    1010                       1015                       1020


     Thr Lys Leu Glu Asn Leu Arg Ile Leu Thr Glu Leu Leu Ile Ser
25        1025                       1030                       1035


     Tyr Ser Lys Asp Thr Lys Asn Ile Phe Lys Arg Phe Pro Asn Leu
          1040                       1045                       1050

30
     Gln Leu Leu Ser Phe Glu Leu Lys Glu Ser Trp Asp Tyr Ser Thr·
          1055                       1060                       1065


35
     Glu Gln His Trp Phe Ser Glu Leu Asp Phe Leu Thr Glu Leu Glu
          1070                       1075                       1080


40   Thr Leu Ser Val Gly Phe Lys Ser Ser Asn Thr Asn Asp Ser Gly
          1085                       1090                       1095


     Ser Ser Val Ala Thr Asn Arg Pro Trp Asp Phe His Phe Pro Ser
45        1100                       1105                       1110


     Asn Leu Lys Ile Leu Trp Leu Arg Glu Phe Pro Leu Thr Ser Asp
          1115                       1120                       1125

50
     Ser Leu Ser Thr Ile Ala Arg Leu Pro Asn Leu Glu Glu Leu Ser
          1130                       1135                       1140


55
     Leu Tyr His Thr Ile Ile His Gly Glu Glu Trp Asn Met Gly Glu
          1145                       1150                       1155


60   Glu Asp Thr Phe Glu Asn Leu Lys Phe Leu Asn Phe Asn Gln Val
          1160                       1165                       1170


     Ser Ile Ser Lys Trp Glu Val Gly Glu Glu Ser Phe Pro Asn Leu
65        1175                       1180                       1185


     Glu Lys Leu Lys Leu Arg Gly Cys His Lys Leu Glu Glu Ile Pro

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               1190                    1195                    1200


  5    Pro Ser Phe Gly Asp Ile Tyr Ser Leu Lys Ser Ile Lys Ile Val
           1205                    1210                    1215


       Lys Ser Pro Gln Leu Glu Asp Ser Ala Leu Lys Ile Lys Glu Tyr
           1220                    1225                    1230
 10

       Ala Glu Asp Met Arg Gly Gly Asp Glu Leu Gln Ile Leu Gly Gln
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       Lys Asn Ile Pro Leu Phe Lys
           1250                    1255


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       Met Glu Lys Arg Lys Asp Ile Glu Glu Ala Asn Asn Ser Leu Val Leu
       1               5                   10                  15

 45    ttt tct gct ctt agc aag gac att gcc aat gtt cta att ttc cta gag      96
       Phe Ser Ala Leu Ser Lys Asp Ile Ala Asn Val Leu Ile Phe Leu Glu
                   20                  25                  30

       aat gag gaa aat caa aaa gct ctt gac aaa gat caa gtt gaa aag cta     144
 50    Asn Glu Glu Asn Gln Lys Ala Leu Asp Lys Asp Gln Val Glu Lys Leu
                   35                  40                  45

       aaa ttg aaa atg gca ttt att tgt aca tat gtt cag ctt tct tat tcc     192
       Lys Leu Lys Met Ala Phe Ile Cys Thr Tyr Val Gln Leu Ser Tyr Ser
 55        50                  55                  60

       gat ttt gag cag ttt gaa gat ata atg act aga aat aga caa gag gtt     240
       Asp Phe Glu Gln Phe Glu Asp Ile Met Thr Arg Asn Arg Gln Glu Val
       65                  70                  75                  80
 60
       gag aat ctg ctt caa tca ctt ttg gat gat gat gtc ctt act agc ctc     288
       Glu Asn Leu Leu Gln Ser Leu Leu Asp Asp Asp Val Leu Thr Ser Leu
                       85                  90                  95

 65    acc agt aat atg gat gac tgt atc agc ttg tat cat cgt tct tat aaa     336
       Thr Ser Asn Met Asp Asp Cys Ile Ser Leu Tyr His Arg Ser Tyr Lys
                   100                 105                 110
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**40**

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      tca gat gcc atc atg atg gat gag caa ttg gac ttc ctc ctc ttg aat    384
      Ser Asp Ala Ile Met Met Asp Glu Gln Leu Asp Phe Leu Leu Leu Asn
              115             120                 125

 5    ctg tat cat cta tcc aag cat cac gct gaa aag ata ttt cct gga gtg    432
      Leu Tyr His Leu Ser Lys His His Ala Glu Lys Ile Phe Pro Gly Val
              130             135                 140

10    act caa tat gaa gtt ctt cag aat gta tgt ggc aac ata aga gat ttc    480
      Thr Gln Tyr Glu Val Leu Gln Asn Val Cys Gly Asn Ile Arg Asp Phe
      145                 150                 155                 160

      cat ggg ttg ata ctg aat ggt tgc att aag cat gag atg gtt gag aat    528
      His Gly Leu Ile Leu Asn Gly Cys Ile Lys His Glu Met Val Glu Asn
15                      165                 170                 175

      gtc tta cct ctg ttt caa ctc atg gct gaa aga gta gga cac ttc ctt    576
      Val Leu Pro Leu Phe Gln Leu Met Ala Glu Arg Val Gly His Phe Leu
                      180                 185                 190
20
      tgg gag gat cag act gat gaa gac tct cgg ctc tcc gag cta gat gag    624
      Trp Glu Asp Gln Thr Asp Glu Asp Ser Arg Leu Ser Glu Leu Asp Glu
                  195                 200                 205

25    gat gaa cac aat gat aga gac tct cga ctc ttc cag cta aca cat cta    672
      Asp Glu His Asn Asp Arg Asp Ser Arg Leu Phe Gln Leu Thr His Leu
                  210                 215                 220

      ctc ttg aag att gtt cca act gaa ctg gag gtt atg cac ata tgt tat    720
30    Leu Leu Lys Ile Val Pro Thr Glu Leu Glu Val Met His Ile Cys Tyr
      225                 230                 235                 240

      aca aat ttg aaa gct tca act tca gca gaa gtt gga cgc ttc att aag    768
      Thr Asn Leu Lys Ala Ser Thr Ser Ala Glu Val Gly Arg Phe Ile Lys
35                      245                 250                 255

      aag ctc ctg gaa acc tca ccg gat att ctc aga gaa tat atc att caa    816
      Lys Leu Leu Glu Thr Ser Pro Asp Ile Leu Arg Glu Tyr Ile Ile Gln
                  260                 265                 270
40
      cta caa gag cat atg tta act gtt att ccc cct agc act tta ggg gct    864
      Leu Gln Glu His Met Leu Thr Val Ile Pro Pro Ser Thr Leu Gly Ala
                  275                 280                 285

45    cga aac att cat gtc atg atg gaa ttc cta tta ctt att ctt tct gat    912
      Arg Asn Ile His Val Met Met Glu Phe Leu Leu Leu Ile Leu Ser Asp
                  290                 295                 300

      atg ccc aag gac ttt att cat cat gac aaa ctt ttt gat ctc ttg gct    960
50    Met Pro Lys Asp Phe Ile His His Asp Lys Leu Phe Asp Leu Leu Ala
      305                 310                 315                 320

      cat gtt gga aca ctt acc agg gag gta tcg act ctt gta cgt gac ttg   1008
      His Val Gly Thr Leu Thr Arg Glu Val Ser Thr Leu Val Arg Asp Leu
55                      325                 330                 335

      gaa gag aaa tta agg aat aaa gag ggt aat aac caa aca aat tgt gca   1056
      Glu Glu Lys Leu Arg Asn Lys Glu Gly Asn Asn Gln Thr Asn Cys Ala
                  340                 345                 350
60
      acc cta gac ttg ctg gaa aat att gaa ctc ctc aag aaa gat ctc aaa   1104
      Thr Leu Asp Leu Leu Glu Asn Ile Glu Leu Leu Lys Lys Asp Leu Lys
                  355                 360                 365

65    cat gtt tat ctg aaa gcc cca aat tca tct caa tgt tgc ttc ccc atg   1152
      His Val Tyr Leu Lys Ala Pro Asn Ser Ser Gln Cys Cys Phe Pro Met
                  370                 375                 380
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      agt gat gga cca ctc ttc atg cat ctt cta cac atg cac tta aat gat        1200
      Ser Asp Gly Pro Leu Phe Met His Leu Leu His Met His Leu Asn Asp
      385             390             395             400

5     ttg cta gat tct aat gct tat tca att tct ttg ata aag gaa gaa atc        1248
      Leu Leu Asp Ser Asn Ala Tyr Ser Ile Ser Leu Ile Lys Glu Glu Ile
                      405             410             415

10    gag ttg gtg agt caa gaa ctg gaa ttc ata aga tca ttc ttt ggg gat        1296
      Glu Leu Val Ser Gln Glu Leu Glu Phe Ile Arg Ser Phe Phe Gly Asp
                  420             425             430

      gct gct gag caa gga ttg tat aaa gat atc tgg gca cgt gtt cta gat        1344
15    Ala Ala Glu Gln Gly Leu Tyr Lys Asp Ile Trp Ala Arg Val Leu Asp
                  435             440             445

      gtg gct tat gag gca aaa gat gtc ata gat tca att att gtt cga gat        1392
      Val Ala Tyr Glu Ala Lys Asp Val Ile Asp Ser Ile Ile Val Arg Asp
          450             455             460
20
      aat ggt ctc tta cat ctt att ttc tca ctt ccc att acc ata aag aag        1440
      Asn Gly Leu Leu His Leu Ile Phe Ser Leu Pro Ile Thr Ile Lys Lys
      465             470             475             480

25    atc aaa ctt atc aaa gaa gag atc tct gct tta gat gag aac att ccc        1488
      Ile Lys Leu Ile Lys Glu Glu Ile Ser Ala Leu Asp Glu Asn Ile Pro
                      485             490             495

      aag gac aga ggt cta atc gtt gtg aac tct ccc aag aaa cca gtt gag        1536
30    Lys Asp Arg Gly Leu Ile Val Val Asn Ser Pro Lys Lys Pro Val Glu
                  500             505             510

      aga aag tca ttg aca act gat aaa ata att gta ggt ttt gag gag gag        1584
      Arg Lys Ser Leu Thr Thr Asp Lys Ile Ile Val Gly Phe Glu Glu Glu
35                515             520             525

      aca aac ttg ata ctt aga aag ctc acc agt gga ccc gca gat tta gat        1632
      Thr Asn Leu Ile Leu Arg Lys Leu Thr Ser Gly Pro Ala Asp Leu Asp
          530             535             540
40
      gtc att tcg atc acc ggt atg ccg ggt tca ggt aaa act act ttg gca        1680
      Val Ile Ser Ile Thr Gly Met Pro Gly Ser Gly Lys Thr Thr Leu Ala
      545             550             555             560

45    tac aaa gta tac aat gat aag tca gtt tct aga cat ttt gac ctt cgt        1728
      Tyr Lys Val Tyr Asn Asp Lys Ser Val Ser Arg His Phe Asp Leu Arg
                      565             570             575

      gca tgg tgc acg gtc gat caa gga tat gac gac aag aag ttg ttg gat        1776
50    Ala Trp Cys Thr Val Asp Gln Gly Tyr Asp Asp Lys Lys Leu Leu Asp
                  580             585             590

      aca att ttc agt caa gtt agt ggc tca gat tca aat ttg agt gag aat        1824
      Thr Ile Phe Ser Gln Val Ser Gly Ser Asp Ser Asn Leu Ser Glu Asn
55                595             600             605

      att gat gtt gct gat aaa ttg cgg aaa caa ctg ttt gga aag agg tat        1872
      Ile Asp Val Ala Asp Lys Leu Arg Lys Gln Leu Phe Gly Lys Arg Tyr
                  610             615             620
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      ctt att gtc tta gat gat gtg tgg gat act act aca ttg gat gag ttg        1920
      Leu Ile Val Leu Asp Asp Val Trp Asp Thr Thr Thr Leu Asp Glu Leu
      625             630             635             640

65    aca aga cct ttt cct gaa gct aag aaa gga agt agg att att ttg aca        1968
      Thr Arg Pro Phe Pro Glu Ala Lys Lys Gly Ser Arg Ile Ile Leu Thr
                      645             650             655
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     act cga gaa aag gaa gtg gct ttg cat gga aag ctg aac act gat cct    2016
     Thr Arg Glu Lys Glu Val Ala Leu His Gly Lys Leu Asn Thr Asp Pro
             660             665                 670

5    ctt gac ctt cga ttg cta aga cca gat gaa agt tgg gaa ctt tta gat    2064
     Leu Asp Leu Arg Leu Leu Arg Pro Asp Glu Ser Trp Glu Leu Leu Asp
             675                 680             685

10   aaa agg aca ttt ggt aat gag agt tgc cct gat gaa cta tta gat gtc    2112
     Lys Arg Thr Phe Gly Asn Glu Ser Cys Pro Asp Glu Leu Leu Asp Val
             690             695                 700

     ggt aaa gaa ata gcc gaa aat tgt aaa ggg ctt cct ttg gtg gct gat    2160
     Gly Lys Glu Ile Ala Glu Asn Cys Lys Gly Leu Pro Leu Val Ala Asp
15   705             710                 715                 720

     ctg att gct gga gtc att gct ggg agg gaa aag aaa agg agt gtg tgg    2208
     Leu Ile Ala Gly Val Ile Ala Gly Arg Glu Lys Lys Arg Ser Val Trp
                 725             730                 735
20

     ctt gaa gtt caa agt agt ttg agt tct ttt att ttg aac agt gaa gtg    2256
     Leu Glu Val Gln Ser Ser Leu Ser Ser Phe Ile Leu Asn Ser Glu Val
             740                 745                 750

25   gaa gtg atg aaa gtt ata gaa tta agt tat gac cat tta cca cat cac    2304
     Glu Val Met Lys Val Ile Glu Leu Ser Tyr Asp His Leu Pro His His
             755                 760                 765

     ctc aag cca tgc ttg ctt cac ttt gca agt tgg ccg aag gac act cct    2352
30   Leu Lys Pro Cys Leu Leu His Phe Ala Ser Trp Pro Lys Asp Thr Pro
             770                 775                 780

     ttg aca atc tat ttg ttt act gtt tat ttg ggt gct gaa gga ttt gtg    2400
     Leu Thr Ile Tyr Leu Phe Thr Val Tyr Leu Gly Ala Glu Gly Phe Val
35   785                 790                 795                 800

     gaa aag acg gag atg aag ggt ata gaa gaa gtg gtg aag att tat atg    2448
     Glu Lys Thr Glu Met Lys Gly Ile Glu Glu Val Val Lys Ile Tyr Met
                 805                 810                 815
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     gat gat tta att tcc agt agc ttg gta att tgt ttc aat gag ata ggt    2496
     Asp Asp Leu Ile Ser Ser Ser Leu Val Ile Cys Phe Asn Glu Ile Gly
                 820                 825                 830

45   gat ata ctg aat ttc caa att cat gat ctt gtg cat gac ttt tgt ttg    2544
     Asp Ile Leu Asn Phe Gln Ile His Asp Leu Val His Asp Phe Cys Leu
             835                 840                 845

     ata aaa gca aga aag gaa aat ttg ttt gat cgg ata aga tca agt gct    2592
50   Ile Lys Ala Arg Lys Glu Asn Leu Phe Asp Arg Ile Arg Ser Ser Ala
             850                 855                 860

     cca tca gat ttg ttg cct cgt caa att acc att gat tat gat gag gag    2640
     Pro Ser Asp Leu Leu Pro Arg Gln Ile Thr Ile Asp Tyr Asp Glu Glu
55   865                 870                 875                 880

     gag gag cac ttt ggg ctt aat ttt gtc atg ttc gat tca aat aag aaa    2688
     Glu Glu His Phe Gly Leu Asn Phe Val Met Phe Asp Ser Asn Lys Lys
                 885                 890                 895
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     agg cat tct ggt aaa cac ctc tat tct ttg agg ata aat gga gac cag    2736
     Arg His Ser Gly Lys His Leu Tyr Ser Leu Arg Ile Asn Gly Asp Gln
                 900                 905                 910

65   ctg gat gac agt gtt tct gat gca ttt cac cta aga cac ttg agg ctt    2784
     Leu Asp Asp Ser Val Ser Asp Ala Phe His Leu Arg His Leu Arg Leu
             915                 920                 925
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     att aga gtg ttg gac ctg gaa ccc tct tta atc atg gtg aat gat tct     2832
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5    ttg ctg aat gaa ata tgc atg ttg aat cat ttg agg tac tta aga att     2880
     Leu Leu Asn Glu Ile Cys Met Leu Asn His Leu Arg Tyr Leu Arg Ile
     945                 950                 955                 960

10   cgg aca caa gtt aaa tat ctg cct ttc tct ttc tca aac ctc tgg aat     2928
     Arg Thr Gln Val Lys Tyr Leu Pro Phe Ser Phe Ser Asn Leu Trp Asn
                     965                 970                 975

     cta gaa agt ctg ttt gtg tct aac aaa gga tca atc ttg gta cta tta     2976
     Leu Glu Ser Leu Phe Val Ser Asn Lys Gly Ser Ile Leu Val Leu Leu
15                   980                 985                 990

     ccg aga att ttg gat ctt gta aag ttg cga gtg ctg tcc gtg ggt gct     3024
     Pro Arg Ile Leu Asp Leu Val Lys Leu Arg Val Leu Ser Val Gly Ala
                 995                 1000                1005
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     tgt tct ttc ttt gat atg gat gca gat gaa tca ata ttg ata gca        3069
     Cys Ser Phe Phe Asp Met Asp Ala Asp Glu Ser Ile Leu Ile Ala
         1010                1015                1020

25   aag gac aca aag tta gag aac ttg aga ata tta ggg gaa ctg ttg        3114
     Lys Asp Thr Lys Leu Glu Asn Leu Arg Ile Leu Gly Glu Leu Leu
         1025                1030                1035

     att tcc tat tcg aaa gat aca atg aat att ttc aaa agg ttt ccc        3159
30   Ile Ser Tyr Ser Lys Asp Thr Met Asn Ile Phe Lys Arg Phe Pro
         1040                1045                1050

     aat ctt cag gtg ctt cag ttt gaa ctc aag gag tca tgg gat tat        3204
     Asn Leu Gln Val Leu Gln Phe Glu Leu Lys Glu Ser Trp Asp Tyr
35       1055                1060                1065

     tca aca gag caa cat tgg ttc ccg aaa ttg gat tgc cta act gaa        3249
     Ser Thr Glu Gln His Trp Phe Pro Lys Leu Asp Cys Leu Thr Glu
         1070                1075                1080
40
     cta gaa aca ctc tgt gta ggt ttt aaa agt tca aac aca aac cac        3294
     Leu Glu Thr Leu Cys Val Gly Phe Lys Ser Ser Asn Thr Asn His
         1085                1090                1095

45   tgt ggg tcc tct gtt gtg aca aat cgg ccg tgg gat ttt cac ttc        3339
     Cys Gly Ser Ser Val Val Thr Asn Arg Pro Trp Asp Phe His Phe
         1100                1105                1110

     cct tca aat ttg aaa gaa ctg ttg ttg tat gac ttt cct ctg aca        3384
50   Pro Ser Asn Leu Lys Glu Leu Leu Leu Tyr Asp Phe Pro Leu Thr
         1115                1120                1125

     tcc gat tca cta tca aca ata gcg aga ctg ccc aac ctt gaa aat        3429
     Ser Asp Ser Leu Ser Thr Ile Ala Arg Leu Pro Asn Leu Glu Asn
55       1130                1135                1140

     ttg tcc ctt tat gat aca atc atc cag gga gaa gaa tgg aac atg        3474
     Leu Ser Leu Tyr Asp Thr Ile Ile Gln Gly Glu Glu Trp Asn Met
         1145                1150                1155
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     ggg gag gaa gac act ttt gag aat ctc aaa ttt ttg aac ttg cgt        3519
     Gly Glu Glu Asp Thr Phe Glu Asn Leu Lys Phe Leu Asn Leu Arg
         1160                1165                1170

65   cta ctg act ctt tcc aag tgg gag gtt gga gag gaa tcc ttc ccc        3564
     Leu Leu Thr Leu Ser Lys Trp Glu Val Gly Glu Glu Ser Phe Pro
         1175                1180                1185
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        aat ctt  gag aaa tta aaa ctg  cag gaa tgt ggt aag  ctt gag gag        3609
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            1190             1195              1200

5       att cca  cct agt ttt gga gat  att tat tca ttg aaa  ttt atc aaa        3654
        Ile Pro  Pro Ser Phe Gly Asp  Ile Tyr Ser Leu Lys  Phe Ile Lys
            1205             1210              1215

10      att gta  aag agt cct caa ctt  gaa gat tct gct ctc  aag att aag        3699
        Ile Val  Lys Ser Pro Gln Leu  Glu Asp Ser Ala Leu  Lys Ile Lys
            1220             1225              1230

        aaa tac  gct gaa gat atg aga  gga ggg aac gat ctt  cag atc ctt        3744
        Lys Tyr  Ala Glu Asp Met Arg  Gly Gly Asn Asp Leu  Gln Ile Leu
15          1235             1240              1245

        ggc cag  aag aat atc ccc tta  ttt aag tag                             3774
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                    20                  25                  30

        Asn Glu Glu Asn Gln Lys Ala Leu Asp Lys Asp Gln Val Glu Lys Leu
                35                  40                  45

        Lys Leu Lys Met Ala Phe Ile Cys Thr Tyr Val Gln Leu Ser Tyr Ser
            50                  55                  60

        Asp Phe Glu Gln Phe Glu Asp Ile Met Thr Arg Asn Arg Gln Glu Val
        65                  70                  75                  80

        Glu Asn Leu Leu Gln Ser Leu Leu Asp Asp Asp Val Leu Thr Ser Leu
                        85                  90                  95

        Thr Ser Asn Met Asp Asp Cys Ile Ser Leu Tyr His Arg Ser Tyr Lys
                    100                 105                 110

        Ser Asp Ala Ile Met Met Asp Glu Gln Leu Asp Phe Leu Leu Leu Asn
                    115                 120                 125

        Leu Tyr His Leu Ser Lys His His Ala Glu Lys Ile Phe Pro Gly Val
                    130                 135                 140
```

Thr Gln Tyr Glu Val Leu Gln Asn Val Cys Gly Asn Ile Arg Asp Phe
145                 150                 155                 160

His Gly Leu Ile Leu Asn Gly Cys Ile Lys His Glu Met Val Glu Asn
                    165                 170                 175

Val Leu Pro Leu Phe Gln Leu Met Ala Glu Arg Val Gly His Phe Leu
            180                 185                 190

Trp Glu Asp Gln Thr Asp Glu Asp Ser Arg Leu Ser Glu Leu Asp Glu
            195                 200                 205

Asp Glu His Asn Asp Arg Asp Ser Arg Leu Phe Gln Leu Thr His Leu
    210                 215                 220

Leu Leu Lys Ile Val Pro Thr Glu Leu Glu Val Met His Ile Cys Tyr
225                 230                 235                 240

Thr Asn Leu Lys Ala Ser Thr Ser Ala Glu Val Gly Arg Phe Ile Lys
                245                 250                 255

Lys Leu Leu Glu Thr Ser Pro Asp Ile Leu Arg Glu Tyr Ile Ile Gln
                260                 265                 270

Leu Gln Glu His Met Leu Thr Val Ile Pro Pro Ser Thr Leu Gly Ala
            275                 280                 285

Arg Asn Ile His Val Met Met Glu Phe Leu Leu Leu Ile Leu Ser Asp
    290                 295                 300

Met Pro Lys Asp Phe Ile His His Asp Lys Leu Phe Asp Leu Leu Ala
305                 310                 315                 320

His Val Gly Thr Leu Thr Arg Glu Val Ser Thr Leu Val Arg Asp Leu
                325                 330                 335

Glu Glu Lys Leu Arg Asn Lys Glu Gly Asn Asn Gln Thr Asn Cys Ala
                340                 345                 350

Thr Leu Asp Leu Leu Glu Asn Ile Glu Leu Leu Lys Lys Asp Leu Lys
        355                 360                 365

His Val Tyr Leu Lys Ala Pro Asn Ser Ser Gln Cys Cys Phe Pro Met
    370                 375                 380

Ser Asp Gly Pro Leu Phe Met His Leu Leu His Met His Leu Asn Asp
385                 390                 395                 400

Leu Leu Asp Ser Asn Ala Tyr Ser Ile Ser Leu Ile Lys Glu Glu Ile
                405                 410                 415

```
     Glu Leu Val Ser Gln Glu Leu Glu Phe Ile Arg Ser Phe Phe Gly Asp
                 420                 425             430

 5
     Ala Ala Glu Gln Gly Leu Tyr Lys Asp Ile Trp Ala Arg Val Leu Asp
                 435                 440             445

10   Val Ala Tyr Glu Ala Lys Asp Val Ile Asp Ser Ile Ile Val Arg Asp
                 450                 455             460

15   Asn Gly Leu Leu His Leu Ile Phe Ser Leu Pro Ile Thr Ile Lys Lys
     465                 470                 475             480

     Ile Lys Leu Ile Lys Glu Glu Ile Ser Ala Leu Asp Glu Asn Ile Pro
20                   485                 490             495

     Lys Asp Arg Gly Leu Ile Val Val Asn Ser Pro Lys Lys Pro Val Glu
                 500                 505             510

25
     Arg Lys Ser Leu Thr Thr Asp Lys Ile Ile Val Gly Phe Glu Glu Glu
                 515                 520             525

30   Thr Asn Leu Ile Leu Arg Lys Leu Thr Ser Gly Pro Ala Asp Leu Asp
                 530                 535             540

     Val Ile Ser Ile Thr Gly Met Pro Gly Ser Gly Lys Thr Thr Leu Ala
35   545                 550                 555             560

     Tyr Lys Val Tyr Asn Asp Lys Ser Val Ser Arg His Phe Asp Leu Arg
                 565                 570             575
40
     Ala Trp Cys Thr Val Asp Gln Gly Tyr Asp Asp Lys Lys Leu Leu Asp
                 580                 585             590

45
     Thr Ile Phe Ser Gln Val Ser Gly Ser Asp Ser Asn Leu Ser Glu Asn
                 595                 600             605

50   Ile Asp Val Ala Asp Lys Leu Arg Lys Gln Leu Phe Gly Lys Arg Tyr
     610                 615                 620

     Leu Ile Val Leu Asp Asp Val Trp Asp Thr Thr Thr Leu Asp Glu Leu
55   625                 630                 635             640

     Thr Arg Pro Phe Pro Glu Ala Lys Lys Gly Ser Arg Ile Ile Leu Thr
                 645                 650             655
60
     Thr Arg Glu Lys Glu Val Ala Leu His Gly Lys Leu Asn Thr Asp Pro
                 660                 665             670

65
     Leu Asp Leu Arg Leu Leu Arg Pro Asp Glu Ser Trp Glu Leu Leu Asp
                 675                 680             685
```

Lys Arg Thr Phe Gly Asn Glu Ser Cys Pro Asp Glu Leu Leu Asp Val
    690              695              700

5

Gly Lys Glu Ile Ala Glu Asn Cys Lys Gly Leu Pro Leu Val Ala Asp
705              710              715              720

10  Leu Ile Ala Gly Val Ile Ala Gly Arg Glu Lys Lys Arg Ser Val Trp
                725              730              735

Leu Glu Val Gln Ser Ser Leu Ser Ser Phe Ile Leu Asn Ser Glu Val
15              740              745              750

Glu Val Met Lys Val Ile Glu Leu Ser Tyr Asp His Leu Pro His His
        755              760              765

20

Leu Lys Pro Cys Leu Leu His Phe Ala Ser Trp Pro Lys Asp Thr Pro
    770              775              780

25  Leu Thr Ile Tyr Leu Phe Thr Val Tyr Leu Gly Ala Glu Gly Phe Val
    785              790              795              800

30  Glu Lys Thr Glu Met Lys Gly Ile Glu Glu Val Val Lys Ile Tyr Met
                805              810              815

Asp Asp Leu Ile Ser Ser Ser Leu Val Ile Cys Phe Asn Glu Ile Gly
35              820              825              830

Asp Ile Leu Asn Phe Gln Ile His Asp Leu Val His Asp Phe Cys Leu
        835              840              845

40

Ile Lys Ala Arg Lys Glu Asn Leu Phe Asp Arg Ile Arg Ser Ser Ala
    850              855              860

45  Pro Ser Asp Leu Leu Pro Arg Gln Ile Thr Ile Asp Tyr Asp Glu Glu
    865              870              875              880

50  Glu Glu His Phe Gly Leu Asn Phe Val Met Phe Asp Ser Asn Lys Lys
                885              890              895

Arg His Ser Gly Lys His Leu Tyr Ser Leu Arg Ile Asn Gly Asp Gln
55              900              905              910

Leu Asp Asp Ser Val Ser Asp Ala Phe His Leu Arg His Leu Arg Leu
        915              920              925

60

Ile Arg Val Leu Asp Leu Glu Pro Ser Leu Ile Met Val Asn Asp Ser
    930              935              940

65

Leu Leu Asn Glu Ile Cys Met Leu Asn His Leu Arg Tyr Leu Arg Ile
    945              950              955              960

```
        Arg Thr Gln Val Lys Tyr Leu Pro Phe Ser Phe Ser Asn Leu Trp Asn
                        965                 970                 975

  5
        Leu Glu Ser Leu Phe Val Ser Asn Lys Gly Ser Ile Leu Val Leu Leu
                        980                 985                 990


 10     Pro Arg Ile Leu Asp Leu Val Lys  Leu Arg Val Leu Ser  Val Gly Ala
                        995                1000                1005


        Cys Ser  Phe Phe Asp Met Asp  Ala Asp Glu Ser Ile  Leu Ile Ala
 15         1010                1015                1020


        Lys Asp  Thr Lys Leu Glu Asn  Leu Arg Ile Leu Gly  Glu Leu Leu
            1025                1030                1035
 20

        Ile Ser  Tyr Ser Lys Asp Thr  Met Asn Ile Phe Lys  Arg Phe Pro
            1040                1045                1050

 25
        Asn Leu  Gln Val Leu Gln Phe  Glu Leu Lys Glu Ser  Trp Asp Tyr
            1055                1060                1065


 30     Ser Thr  Glu Gln His Trp Phe  Pro Lys Leu Asp Cys  Leu Thr Glu
            1070                1075                1080


        Leu Glu  Thr Leu Cys Val Gly  Phe Lys Ser Ser Asn  Thr Asn His
 35         1085                1090                1095


        Cys Gly  Ser Ser Val Val Thr  Asn Arg Pro Trp Asp  Phe His Phe
            1100                1105                1110
 40

        Pro Ser  Asn Leu Lys Glu Leu  Leu Leu Tyr Asp Phe  Pro Leu Thr
            1115                1120                1125

 45
        Ser Asp  Ser Leu Ser Thr Ile  Ala Arg Leu Pro Asn  Leu Glu Asn
            1130                1135                1140


 50     Leu Ser  Leu Tyr Asp Thr Ile  Ile Gln Gly Glu Glu  Trp Asn Met
            1145                1150                1155


        Gly Glu  Glu Asp Thr Phe Glu  Asn Leu Lys Phe Leu  Asn Leu Arg
 55         1160                1165                1170


        Leu Leu  Thr Leu Ser Lys Trp  Glu Val Gly Glu Glu  Ser Phe Pro
            1175                1180                1185
 60

        Asn Leu  Glu Lys Leu Lys Leu  Gln Glu Cys Gly Lys  Leu Glu Glu
            1190                1195                1200

 65
        Ile Pro  Pro Ser Phe Gly Asp  Ile Tyr Ser Leu Lys  Phe Ile Lys
            1205                1210                1215
```

```
Ile Val Lys Ser Pro Gln Leu Glu Asp Ser Ala Leu Lys Ile Lys
    1220             1225             1230

Lys Tyr Ala Glu Asp Met Arg Gly Gly Asn Asp Leu Gln Ile Leu
    1235             1240             1245

Gly Gln Lys Asn Ile Pro Leu Phe Lys
    1250             1255
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<210>  11
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<400>  11
ttgtggttat cgatgagaat                                                    20


<210>  12
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<400>  12
gaaacaacag caggatagtg ag                                                 22


<210>  13
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<222>   (1)..(20)

<223>


<400>  13
ttgtggttat cgatgagaat                                                        20


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<223>


<400>  14
gaaacaacag caggatagtg ag                                                     22


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<223>


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gaattcagca caaataccaa                                                        20


<210>  16

<211>  20
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<223>


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<400>  18
ttctgcctaa ttgccctgtg                                              20
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<223>


<400>  19
ggggttggga agacaacgac ac                                                    22


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<400>  20
aattccaaga tacagtcaaa tac                                                   23


<210>  21
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<400>  21
aggcaggatt aacagtagaa g                                       21

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<400>  22
catgctttta ggaagaagct c                                       21

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<400>  24
acgtttctca cacctacagg                                         20

<210>  25
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20 <400> 25
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<210> 26

25 <211> 20

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<400> 26

35 taagatccaa accagccacc                                                   20


<210> 27

40 <211> 21

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ccttatcaca catgtggcta c                                                  21

60


<210> 28

65 <211> 22

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<400> 28
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<210> 29

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<400> 29
ttcttcatat ggcagaccaa c                                                          21


<210> 30

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ctactctgct gacatgcagg                                                           20


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     gagattctca aaggtgtctt cc                                           22
20

     <210>  32

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     <400>  32
     aacctgtgct ttcccattcg                                             20
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     <400>  33
     ctttcacaag cgtcactttg g                                           21
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<223>


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taaaaagaat caacagggca ac                                              22


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ccaagaagcc agttgagagc                                                20

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<210> 37

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gtagattaca ctatggatat gg                                             22

30  <210> 38

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50  <400> 38
cagttagcag caatgtcagc                                                20

<210> 39

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<400>  39
cattcaacta ggccaaaagt gg                                                        22

10    <210>  40

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30    <400>  40
ccaggtaggt gttttcttcc                                                           20

35    <210>  41

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50    <223>

55    <400>  41
gttctaagtc agatgccacc                                                           20

<210>  42

60    <211>  19

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10  <400> 42
aagtgctcca acacgagcc                                                    19


<210> 43

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<400> 43

35  tgagttctct taccctgcg                                                   19


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<400> 44
ggatatccag catcaatgcc                                                   20

60


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15     `<400>  45`
       `ggtgagcctc cttgcattcc`                                                    20


       `<210>  46`

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25


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       `<400>  46`
       `cctgagggaa gatgtcacg`                                                     19
40

       `<210>  47`

       `<211>  21`
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       `cctagtttag agtgagtaga c`                                                  21

65
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gtgatatatt gctcaaggat cc                                    22


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gttgctggct gtcactgatc                                       20


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gtgatgtgca gggttcaagg                                       20
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aaatctctct cacaattatc cc                                              22


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ctattgactg aacctgctga g                                          21

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agatcggagt gtgaacatgg                                            20

<210> 56

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cttctacttc tagtcgactg c                                                    21


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cgtagtccat ctgaagctcc                                                      20


<210>  58

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<400>  58
tcttcttctg ctagtcgtcg                                                      20


<210>  59

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       actattctca cgtaagggga cac                                    23


15     <210>  60

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35     <400>  60
       gtgtacatgt atgaaactct agc                                    23


       <210>  61

40     <211>  22

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       <400>  61
       gttcctttca atcagaaagt ag                                     22
60


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65
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ctttggatga gtcaaaaggc t                                                       21


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ctttgacaca gtgttagaat gc                                                      22


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cagaggaaag tcaaccaacg                                        20
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tcggctatga ctgggcacaa caga                                   24


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<400>  70
aagaaggcga tagaaggcga tgcg                                    24
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```
<210>  71

<211>  18

<212>  DNA

<213>  Solanum bulbocastanum


<220>

<221>  mapping_marker

<222>  (1)..(18)

<223>
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<400>  71
tgtaaaacga cggccagt                                          18
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```
<210>  72

<211>  19

<212>  DNA

<213>  Solanum bulbocastanum


<220>

<221>  mapping_marker

<222>  (1)..(19)

<223>
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<400>  72
ggaaacagct atgaccatg                                         19
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<210>  73

<211>  18

<212>  DNA

<213>  Solanum bulbocastanum


<220>

<221>  primer

<222>  (1)..(18)
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&lt;223&gt;

5

&lt;400&gt;  73
ttcagcacaa ataccaat                                          18

10   &lt;210&gt;  74

&lt;211&gt;  18

&lt;212&gt;  DNA

15

&lt;213&gt;  Solanum bulbocastanum


20   &lt;220&gt;

&lt;221&gt;  primer

&lt;222&gt;  (1)..(18)

25

&lt;223&gt;


30   &lt;400&gt;  74
gatgttcccc ttcttttа                                          18

35   &lt;210&gt;  75

&lt;211&gt;  20

&lt;212&gt;  DNA

40   &lt;213&gt;  Solanum bulbocastanum


45   &lt;220&gt;

&lt;221&gt;  primer

&lt;222&gt;  (1)..(20)

50   &lt;223&gt;


55   &lt;400&gt;  75
ttgtggttat cgatgagaat                                        20

&lt;210&gt;  76

60   &lt;211&gt;  20

&lt;212&gt;  DNA

&lt;213&gt;  Solanum bulbocastanum

65


&lt;220&gt;

```
      <221>  primer

      <222>  (1)..(20)
5
      <223>



10    <400>  76
      acctggcgtt ccttattttt                                                    20


      <210>  77
15
      <211>  15

      <212>  DNA

20    <213>  Solanum bulbocastanum



      <220>
25
      <221>  misc_feature

      <222>  (1)..(1)

30    <223>  N= A+T+G+C



      <220>
35
      <221>  primer

      <222>  (1)..(15)

40    <223>



      <220>
45
      <221>  misc_feature

      <222>  (7)..(7)

50    <223>  W=A+T



      <220>
55
      <221>  misc_feature

      <222>  (6)..(6)

60    <223>  S=G+C



      <220>
65
      <221>  misc_feature

      <222>  (10)..(10)
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<223>   N=A+T+G+C

5

<220>

<221>   misc_feature

10   <222>   (12)..(12)

<223>   W=A+T

15
<400>   77
ngtcaswgan awgaa                                              15

20   <210>   78

<211>   21

<212>   DNA
25
<213>   Solanum bulbocastanum


30   <220>

<221>   primer

<222>   (1)..(21)
35
<223>


40   <400>   78
gatggagcgg aaaagccggt g                                      21


<210>   79
45
<211>   21

<212>   DNA

50   <213>   Solanum bulbocastanum


<220>
55
<221>   primer

<222>   (1)..(21)

60   <223>


<400>   79
65   ggtgttttgt agcatctcca g                                      21


<210>   80

<211> 20

<212> DNA

5

<213> Solanum bulbocastanum


10   <220>

<221> primer

<222> (1)..(20)

15

<223>


20   <400> 80
ccatgattac gccaagctgg                                                    20


<210> 81

25

<211> 20

<212> DNA

30   <213> Solanum bulbocastanum


35   <220>

<221> primer

<222> (1)..(20)

40   <223>


<400> 81
45   ggttttccca gtcacgacgt                                                   20


<210> 82

50   <211> 20

<212> DNA

<213> Solanum bulbocastanum

55


<220>

60   <221> primer

<222> (1)..(20)

<223>
65


<400> 82

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agaaagctca ccagtggacc                                                    20


<210>  83

<211>  20

<212>  DNA

<213>  Solanum bulbocastanum


<220>

<221>  primer

<222>  (1)..(20)

<223>


<400>  83
atttatggct gcagaggacc                                                    20


<210>  84

<211>  21

<212>  DNA

<213>  Solanum bulbocastanum


<400>  84
aagtccaatt gctcatccat c                                                  21


<210>  85

<211>  19

<212>  DNA

<213>  Solanum bulbocastanum


<220>

<221>  primer

<222>  (1)..(19)

<223>


<400>  85
tgcaccatgc acgaaggtc                                                     19


<210>  86

<211>  22
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    <212>  DNA

    <213>  Solanum bulbocastanum
5


    <220>

10  <221>  primer

    <222>  (1)..(22)

    <223>
15


    <400>  86
    caatwttggt tcccgaaatt gg                                    22
20


    <210>  87

    <211>  25
25
    <212>  DNA

    <213>  Solanum bulbocastanum

30

    <220>

    <221>  primer
35
    <222>  (1)..(25)

    <223>

40

    <400>  87
    atggaaaaac gaaaagataa tgaag                                 25
45
    <210>  88

    <211>  25

50  <212>  DNA

    <213>  Solanum bulbocastanum


55
    <220>

    <221>  primer

60  <222>  (1)..(25)

    <223>


65
    <400>  88
    ctacttaaat aacgggatat ccttc                                 25
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<210> 89

<211> 20

<212> DNA

<213> Solanum bulbocastanum


<220>

<221> primer

<222> (1)..(20)

<223>


<400> 89
cccatgactc cttgagtttg                                                    20


<210> 90

<211> 21

<212> DNA

<213> Solanum bulbocastanum


<220>

<221> primer

<222> (1)..(21)

<223>


<400> 90
ggtggggttg ggaagacaac g                                                  21


<210> 91

<211> 19

<212> DNA

<213> Solanum bulbocastanum


<220>

<221> primer

<222> (1)..(19)

<223>

<400> 91
gtagactgcg taccaattc                                                    19

<210> 92

<211> 16

<212> DNA

<213> Solanum bulbocastanum

<220>

<221> primer

<222> (1)..(16)

<223>

<400> 92
gatgagtcct gagtaa                                                       16

<210> 93

<211> 2913

<212> DNA

<213> Solanum bulbocastanum

<220>

<221> CDS

<222> (1)..(2913)

<223> Rpi-blb or RB (Song, PNAS, 2003, 9128-9133)

<400> 93

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atg gct gaa gct ttc att caa gtt ctg cta gac aat ctc act tct ttc      48
Met Ala Glu Ala Phe Ile Gln Val Leu Leu Asp Asn Leu Thr Ser Phe
1               5                  10                  15

ctc aaa ggg gaa ctt gta ttg ctt ttc ggt ttt caa gat gag ttc caa      96
Leu Lys Gly Glu Leu Val Leu Leu Phe Gly Phe Gln Asp Glu Phe Gln
            20                  25                  30

agg ctt tca agc atg ttt tct aca att caa gcc gtc ctt gaa gat gct     144
Arg Leu Ser Ser Met Phe Ser Thr Ile Gln Ala Val Leu Glu Asp Ala
            35                  40                  45

cag gag aag caa ctc aac aac aag cct cta gaa aat tgg ttg caa aaa     192
Gln Glu Lys Gln Leu Asn Asn Lys Pro Leu Glu Asn Trp Leu Gln Lys
        50                  55                  60

ctc aat gct gct aca tat gaa gtc gat gac atc ttg gat gaa tat aaa     240
Leu Asn Ala Ala Thr Tyr Glu Val Asp Asp Ile Leu Asp Glu Tyr Lys
```

```
            65                    70                    75                    80

      acc aag gcc aca aga ttc tcc cag tct gaa tat ggc cgt tat cat cca     288
 5    Thr Lys Ala Thr Arg Phe Ser Gln Ser Glu Tyr Gly Arg Tyr His Pro
                        85                    90                    95

      aag gtt atc cct ttc cgt cac aag gtc ggg aaa agg atg gac caa gtg     336
      Lys Val Ile Pro Phe Arg His Lys Val Gly Lys Arg Met Asp Gln Val
10                      100                   105                   110

      atg aaa aaa cta aag gca att gct gag gaa aga aag aat ttt cat ttg     384
      Met Lys Lys Leu Lys Ala Ile Ala Glu Glu Arg Lys Asn Phe His Leu
                        115                   120                   125

15    cac gaa aaa att gta gag aga caa gct gtt aga cgg gaa aca ggt tct     432
      His Glu Lys Ile Val Glu Arg Gln Ala Val Arg Arg Glu Thr Gly Ser
                 130                   135                   140

      gta tta acc gaa ccg cag gtt tat gga aga gac aaa gag aaa gat gag     480
20    Val Leu Thr Glu Pro Gln Val Tyr Gly Arg Asp Lys Glu Lys Asp Glu
      145                   150                   155                   160

      ata gtg aaa atc cta ata aac aat gtt agt gat gcc caa cac ctt tca     528
25    Ile Val Lys Ile Leu Ile Asn Asn Val Ser Asp Ala Gln His Leu Ser
                        165                   170                   175

      gtc ctc cca ata ctt ggt atg ggg gga tta gga aaa acg act ctt gcc     576
      Val Leu Pro Ile Leu Gly Met Gly Gly Leu Gly Lys Thr Thr Leu Ala
                        180                   185                   190
30
      caa atg gtc ttc aat gac cag aga gtt act gag cat ttc cat tcc aaa     624
      Gln Met Val Phe Asn Asp Gln Arg Val Thr Glu His Phe His Ser Lys
                 195                   200                   205

35    ata tgg att tgt gtc tcg gaa gat ttt gat gag aag agg tta ata aag     672
      Ile Trp Ile Cys Val Ser Glu Asp Phe Asp Glu Lys Arg Leu Ile Lys
                 210                   215                   220

      gca att gta gaa tct att gaa gga agg cca cta ctt ggt gag atg gac     720
40    Ala Ile Val Glu Ser Ile Glu Gly Arg Pro Leu Leu Gly Glu Met Asp
      225                   230                   235                   240

      ttg gct cca ctt caa aag aag ctt cag gag ttg ctg aat gga aaa aga     768
      Leu Ala Pro Leu Gln Lys Lys Leu Gln Glu Leu Leu Asn Gly Lys Arg
45                      245                   250                   255

      tac ttg ctt gtc tta gat gat gtt tgg aat gaa gat caa cag aag tgg     816
      Tyr Leu Leu Val Leu Asp Asp Val Trp Asn Glu Asp Gln Gln Lys Trp
                        260                   265                   270
50
      gct aat tta aga gca gtc ttg aag gtt gga gca agt ggt gct tct gtt     864
      Ala Asn Leu Arg Ala Val Leu Lys Val Gly Ala Ser Gly Ala Ser Val
                        275                   280                   285

55    cta acc act act cgt ctt gaa aag gtt gga tca att atg gga aca ttg     912
      Leu Thr Thr Thr Arg Leu Glu Lys Val Gly Ser Ile Met Gly Thr Leu
                        290                   295                   300

      caa cca tat gaa ctg tca aat ctg tct caa gaa gat tgt tgg ttg ttg     960
60    Gln Pro Tyr Glu Leu Ser Asn Leu Ser Gln Glu Asp Cys Trp Leu Leu
      305                   310                   315                   320

      ttc atg caa cgt gca ttt gga cac caa gaa gaa ata aat cca aac ctt    1008
      Phe Met Gln Arg Ala Phe Gly His Gln Glu Glu Ile Asn Pro Asn Leu
65                      325                   330                   335

      gtg gca atc gga aag gag att gtg aaa aaa agt ggt ggt gtg cct cta    1056
      Val Ala Ile Gly Lys Glu Ile Val Lys Lys Ser Gly Gly Val Pro Leu
```

```
 5   gca gcc aaa act ctt gga ggt att ttg tgc ttc aag aga gaa gaa aga    1104
     Ala Ala Lys Thr Leu Gly Gly Ile Leu Cys Phe Lys Arg Glu Glu Arg
             355                 360                 365

     gca tgg gaa cat gtg aga gac agt ccg att tgg aat ttg cct caa gat    1152
     Ala Trp Glu His Val Arg Asp Ser Pro Ile Trp Asn Leu Pro Gln Asp
         370                 375                 380
10
     gaa agt tct att ctg cct gcc ctg agg ctt agt tac cat caa ctt cca    1200
     Glu Ser Ser Ile Leu Pro Ala Leu Arg Leu Ser Tyr His Gln Leu Pro
     385                 390                 395                 400

15   ctt gat ttg aaa caa tgc ttt gcg tat tgt gcg gtg ttc cca aag gat    1248
     Leu Asp Leu Lys Gln Cys Phe Ala Tyr Cys Ala Val Phe Pro Lys Asp
                     405                 410                 415

     gcc aaa atg gaa aaa gaa aag cta atc tct ctc tgg atg gcg cat ggt    1296
20   Ala Lys Met Glu Lys Glu Lys Leu Ile Ser Leu Trp Met Ala His Gly
                 420                 425                 430

     ttt ctt tta tca aaa gga aac atg gag cta gag gat gtg ggc gat gaa    1344
     Phe Leu Leu Ser Lys Gly Asn Met Glu Leu Glu Asp Val Gly Asp Glu
25           435                 440                 445

     gta tgg aaa gaa tta tac ttg agg tct ttt ttc caa gag att gaa gtt    1392
     Val Trp Lys Glu Leu Tyr Leu Arg Ser Phe Phe Gln Glu Ile Glu Val
         450                 455                 460
30
     aaa gat ggt aaa act tat ttc aag atg cat gat ctc atc cat gat ttg    1440
     Lys Asp Gly Lys Thr Tyr Phe Lys Met His Asp Leu Ile His Asp Leu
     465                 470                 475                 480

35   gca aca tct ctg ttt tca gca aac aca tca agc agc aat atc cgt gaa    1488
     Ala Thr Ser Leu Phe Ser Ala Asn Thr Ser Ser Ser Asn Ile Arg Glu
                     485                 490                 495

     ata aat aaa cac agt tac aca cat atg atg tcc att ggt ttc gcc gaa    1536
40   Ile Asn Lys His Ser Tyr Thr His Met Met Ser Ile Gly Phe Ala Glu
                 500                 505                 510

     gtg gtg ttt ttt tac act ctt ccc ccc ttg gaa aag ttt atc tcg tta    1584
     Val Val Phe Phe Tyr Thr Leu Pro Pro Leu Glu Lys Phe Ile Ser Leu
45           515                 520                 525

     aga gtg ctt aat cta ggt gat tcg aca ttt aat aag tta cca tct tcc    1632
     Arg Val Leu Asn Leu Gly Asp Ser Thr Phe Asn Lys Leu Pro Ser Ser
         530                 535                 540
50
     att gga gat cta gta cat tta aga tac ttg aac ctg tat ggc agt ggc    1680
     Ile Gly Asp Leu Val His Leu Arg Tyr Leu Asn Leu Tyr Gly Ser Gly
     545                 550                 555                 560

55   atg cgt agt ctt cca aag cag tta tgc aag ctt caa aat ctg caa act    1728
     Met Arg Ser Leu Pro Lys Gln Leu Cys Lys Leu Gln Asn Leu Gln Thr
                     565                 570                 575

     ctt gat cta caa tat tgc acc aag ctt tgt tgt ttg cca aaa gaa aca    1776
60   Leu Asp Leu Gln Tyr Cys Thr Lys Leu Cys Cys Leu Pro Lys Glu Thr
                 580                 585                 590

     agt aaa ctt ggt agt ctc cga aat ctt tta ctt gat ggt agc cag tca    1824
     Ser Lys Leu Gly Ser Leu Arg Asn Leu Leu Leu Asp Gly Ser Gln Ser
65           595                 600                 605

     ttg act tgt atg cca cca agg ata gga tca ttg aca tgc ctt aag act    1872
     Leu Thr Cys Met Pro Pro Arg Ile Gly Ser Leu Thr Cys Leu Lys Thr
```

```
        cta ggt caa ttt gtt gtt gga agg aag aaa ggt tat caa ctt ggt gaa      1920
        Leu Gly Gln Phe Val Val Gly Arg Lys Lys Gly Tyr Gln Leu Gly Glu
 5      625                 630                 635                 640

        cta gga aac cta aat ctc tat ggc tca att aaa atc tcg cat ctt gag      1968
        Leu Gly Asn Leu Asn Leu Tyr Gly Ser Ile Lys Ile Ser His Leu Glu
                        645                 650                 655
10

        aga gtg aag aat gat aag gac gca aaa gaa gcc aat tta tct gca aaa      2016
        Arg Val Lys Asn Asp Lys Asp Ala Lys Glu Ala Asn Leu Ser Ala Lys
                            660                 665                 670

15      ggg aat ctg cat tct tta agc atg agt tgg aat aac ttt gga cca cat      2064
        Gly Asn Leu His Ser Leu Ser Met Ser Trp Asn Asn Phe Gly Pro His
                        675                 680                 685

        ata tat gaa tca gaa gaa gtt aaa gtg ctt gaa gcc ctc aaa cca cac      2112
 20     Ile Tyr Glu Ser Glu Glu Val Lys Val Leu Glu Ala Leu Lys Pro His
                        690                 695                 700

        tcc aat ctg act tct tta aaa atc tat ggc ttc aga gga atc cat ctc      2160
        Ser Asn Leu Thr Ser Leu Lys Ile Tyr Gly Phe Arg Gly Ile His Leu
 25     705                 710                 715                 720

        cca gag tgg atg aat cac tca gta ttg aaa aat att gtc tct att cta      2208
        Pro Glu Trp Met Asn His Ser Val Leu Lys Asn Ile Val Ser Ile Leu
                        725                 730                 735
30

        att agc aac ttc aga aac tgc tca tgc tta cca ccc ttt ggt gat ctg      2256
        Ile Ser Asn Phe Arg Asn Cys Ser Cys Leu Pro Pro Phe Gly Asp Leu
                        740                 745                 750

35      cct tgt cta gaa agt cta gag tta cac tgg ggg tct gcg gat gtg gag      2304
        Pro Cys Leu Glu Ser Leu Glu Leu His Trp Gly Ser Ala Asp Val Glu
                        755                 760                 765

        tat gtt gaa gaa gtg gat att gat gtt cat tct gga ttc ccc aca aga      2352
 40     Tyr Val Glu Glu Val Asp Ile Asp Val His Ser Gly Phe Pro Thr Arg
                        770                 775                 780

        ata agg ttt cca tcc ttg agg aaa ctt gat ata tgg gac ttt ggt agt      2400
        Ile Arg Phe Pro Ser Leu Arg Lys Leu Asp Ile Trp Asp Phe Gly Ser
 45     785                 790                 795                 800

        ctg aaa gga ttg ctg aaa aag gaa gga gaa gag caa ttc cct gtg ctt      2448
        Leu Lys Gly Leu Leu Lys Lys Glu Gly Glu Glu Gln Phe Pro Val Leu
                        805                 810                 815
50

        gaa gag atg ata att cac gag tgc cct ttt ctg acc ctt tct tct aat      2496
        Glu Glu Met Ile Ile His Glu Cys Pro Phe Leu Thr Leu Ser Ser Asn
                        820                 825                 830

55      ctt agg gct ctt act tcc ctc aga att tgc tat aat aaa gta gct act      2544
        Leu Arg Ala Leu Thr Ser Leu Arg Ile Cys Tyr Asn Lys Val Ala Thr
                        835                 840                 845

        tca ttc cca gaa gag atg ttc aaa aac ctt gca aat ctc aaa tac ttg      2592
 60     Ser Phe Pro Glu Glu Met Phe Lys Asn Leu Ala Asn Leu Lys Tyr Leu
        850                 855                 860

        aca atc tct cgg tgc aat aat ctc aaa gag ctg cct acc agc ttg gct      2640
        Thr Ile Ser Arg Cys Asn Asn Leu Lys Glu Leu Pro Thr Ser Leu Ala
 65     865                 870                 875                 880

        agt ctg aat gct ttg aaa agt cta aaa att caa ttg tgt tgc gca cta      2688
        Ser Leu Asn Ala Leu Lys Ser Leu Lys Ile Gln Leu Cys Cys Ala Leu
```

```
                 885                      890                       895
                  .                                                 .
     gag agt ctc cct gag gaa ggg ctg gaa ggt tta tct tca ctc aca gag    2736
     Glu Ser Leu Pro Glu Glu Gly Leu Glu Gly Leu Ser Ser Leu Thr Glu
  5              900                     905                 910

     tta ttt gtt gaa cac tgt aac atg cta aaa tgt tta cca gag gga ttg    2784
     Leu Phe Val Glu His Cys Asn Met Leu Lys Cys Leu Pro Glu Gly Leu
                 915                 920                 925
 10
     cag cac cta aca acc ctc aca agt tta aaa att cgg gga tgt cca caa    2832
     Gln His Leu Thr Thr Leu Thr Ser Leu Lys Ile Arg Gly Cys Pro Gln
                 930             935                 940

 15  ctg atc aag cgg tgt gag aag gga ata gga gaa gac tgg cac aaa att    2880
     Leu Ile Lys Arg Cys Glu Lys Gly Ile Gly Glu Asp Trp His Lys Ile
     945                 950                 955                 960

                                                                        2913
     tct cac att cct aat gtg aat ata tat att taa
 20  Ser His Ile Pro Asn Val Asn Ile Tyr Ile
                 965                 970


 25  <210>  94

     <211>  970

     <212>  PRT

 30  <213>  Solanum bulbocastanum



     <400>  94
 35
     Met Ala Glu Ala Phe Ile Gln Val Leu Leu Asp Asn Leu Thr Ser Phe
     1               5                   10                  15


 40  Leu Lys Gly Glu Leu Val Leu Leu Phe Gly Phe Gln Asp Glu Phe Gln
                 20                  25                  30


     Arg Leu Ser Ser Met Phe Ser Thr Ile Gln Ala Val Leu Glu Asp Ala
 45              35                  40                  45


     Gln Glu Lys Gln Leu Asn Asn Lys Pro Leu Glu Asn Trp Leu Gln Lys
                 50                  55                  60
 50
     Leu Asn Ala Ala Thr Tyr Glu Val Asp Asp Ile Leu Asp Glu Tyr Lys
     65                  70                  75                  80

 55
     Thr Lys Ala Thr Arg Phe Ser Gln Ser Glu Tyr Gly Arg Tyr His Pro
                     85                  90                  95


 60  Lys Val Ile Pro Phe Arg His Lys Val Gly Lys Arg Met Asp Gln Val
                 100                 105                 110


     Met Lys Lys Leu Lys Ala Ile Ala Glu Glu Arg Lys Asn Phe His Leu
 65              115                 120                 125


     His Glu Lys Ile Val Glu Arg Gln Ala Val Arg Arg Glu Thr Gly Ser
```

5    Val Leu Thr Glu Pro Gln Val Tyr Gly Arg Asp Lys Glu Lys Asp Glu
     145              150              155              160

     Ile Val Lys Ile Leu Ile Asn Asn Val Ser Asp Ala Gln His Leu Ser
10                   165              170              175

     Val Leu Pro Ile Leu Gly Met Gly Gly Leu Gly Lys Thr Thr Leu Ala
                 180              185              190

15   Gln Met Val Phe Asn Asp Gln Arg Val Thr Glu His Phe His Ser Lys
              195              200              205

20   Ile Trp Ile Cys Val Ser Glu Asp Phe Asp Glu Lys Arg Leu Ile Lys
         210              215              220

     Ala Ile Val Glu Ser Ile Glu Gly Arg Pro Leu Leu Gly Glu Met Asp
25   225              230              235              240

     Leu Ala Pro Leu Gln Lys Lys Leu Gln Glu Leu Leu Asn Gly Lys Arg
                 245              250              255

30   Tyr Leu Leu Val Leu Asp Asp Val Trp Asn Glu Asp Gln Gln Lys Trp
                 260              265              270

35   Ala Asn Leu Arg Ala Val Leu Lys Val Gly Ala Ser Gly Ala Ser Val
              275              280              285

40   Leu Thr Thr Thr Arg Leu Glu Lys Val Gly Ser Ile Met Gly Thr Leu
         290              295              300

     Gln Pro Tyr Glu Leu Ser Asn Leu Ser Gln Glu Asp Cys Trp Leu Leu
45   305              310              315              320

     Phe Met Gln Arg Ala Phe Gly His Gln Glu Glu Ile Asn Pro Asn Leu
              325              330              335

50   Val Ala Ile Gly Lys Glu Ile Val Lys Lys Ser Gly Gly Val Pro Leu
                 340              345              350

55   Ala Ala Lys Thr Leu Gly Gly Ile Leu Cys Phe Lys Arg Glu Glu Arg
              355              360              365

60   Ala Trp Glu His Val Arg Asp Ser Pro Ile Trp Asn Leu Pro Gln Asp
         370              375              380

     Glu Ser Ser Ile Leu Pro Ala Leu Arg Leu Ser Tyr His Gln Leu Pro
65   385              390              395              400

     Leu Asp Leu Lys Gln Cys Phe Ala Tyr Cys Ala Val Phe Pro Lys Asp

```
                      405                   410                      415


 5    Ala Lys Met Glu Lys Glu Lys Leu Ile Ser Leu Trp Met Ala His Gly
                    420           425               430


      Phe Leu Leu Ser Lys Gly Asn Met Glu Leu Glu Asp Val Gly Asp Glu
                435               440               445
10

      Val Trp Lys Glu Leu Tyr Leu Arg Ser Phe Phe Gln Glu Ile Glu Val
              450           455               460
15
      Lys Asp Gly Lys Thr Tyr Phe Lys Met His Asp Leu Ile His Asp Leu
      465               470               475               480

20    Ala Thr Ser Leu Phe Ser Ala Asn Thr Ser Ser Ser Asn Ile Arg Glu
                    485               490               495


      Ile Asn Lys His Ser Tyr Thr His Met Met Ser Ile Gly Phe Ala Glu
25                  500               505               510


      Val Val Phe Phe Tyr Thr Leu Pro Pro Leu Glu Lys Phe Ile Ser Leu
                515               520               525
30

      Arg Val Leu Asn Leu Gly Asp Ser Thr Phe Asn Lys Leu Pro Ser Ser
              530               535               540
35
      Ile Gly Asp Leu Val His Leu Arg Tyr Leu Asn Leu Tyr Gly Ser Gly
      545               550               555               560


40    Met Arg Ser Leu Pro Lys Gln Leu Cys Lys Leu Gln Asn Leu Gln Thr
                    565               570               575


      Leu Asp Leu Gln Tyr Cys Thr Lys Leu Cys Cys Leu Pro Lys Glu Thr
45              580               585               590


      Ser Lys Leu Gly Ser Leu Arg Asn Leu Leu Leu Asp Gly Ser Gln Ser
              595               600               605
50
      Leu Thr Cys Met Pro Pro Arg Ile Gly Ser Leu Thr Cys Leu Lys Thr
              610               615               620

55
      Leu Gly Gln Phe Val Val Gly Arg Lys Lys Gly Tyr Gln Leu Gly Glu
      625               630               635               640


60    Leu Gly Asn Leu Asn Leu Tyr Gly Ser Ile Lys Ile Ser His Leu Glu
                    645               650               655


      Arg Val Lys Asn Asp Lys Asp Ala Lys Glu Ala Asn Leu Ser Ala Lys
65                  660               665               670


      Gly Asn Leu His Ser Leu Ser Met Ser Trp Asn Asn Phe Gly Pro His
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                    675                       680                       685


          Ile Tyr Glu Ser Glu Glu Val Lys Val Leu Glu Ala Leu Lys Pro His
    5         690                  695                  700


          Ser Asn Leu Thr Ser Leu Lys Ile Tyr Gly Phe Arg Gly Ile His Leu
   10     705             710             715                     720


          Pro Glu Trp Met Asn His Ser Val Leu Lys Asn Ile Val Ser Ile Leu
                              725                 730                 735

   15
          Ile Ser Asn Phe Arg Asn Cys Ser Cys Leu Pro Pro Phe Gly Asp Leu
                      740                 745                 750


   20     Pro Cys Leu Glu Ser Leu Glu Leu His Trp Gly Ser Ala Asp Val Glu
                  755                 760                 765


          Tyr Val Glu Glu Val Asp Ile Asp Val His Ser Gly Phe Pro Thr Arg
   25         770                 775                 780


          Ile Arg Phe Pro Ser Leu Arg Lys Leu Asp Ile Trp Asp Phe Gly Ser
          785                 790                 795                 800
   30
          Leu Lys Gly Leu Leu Lys Lys Glu Gly Glu Glu Gln Phe Pro Val Leu
                      805                 810                 815

   35
          Glu Glu Met Ile Ile His Glu Cys Pro Phe Leu Thr Leu Ser Ser Asn
                      820                 825                 830


   40     Leu Arg Ala Leu Thr Ser Leu Arg Ile Cys Tyr Asn Lys Val Ala Thr
                  835                 840                 845


          Ser Phe Pro Glu Glu Met Phe Lys Asn Leu Ala Asn Leu Lys Tyr Leu
   45         850                 855                 860


          Thr Ile Ser Arg Cys Asn Asn Leu Lys Glu Leu Pro Thr Ser Leu Ala
          865             870                 875                 880
   50
          Ser Leu Asn Ala Leu Lys Ser Leu Lys Ile Gln Leu Cys Cys Ala Leu
                      885                 890                 895

   55
          Glu Ser Leu Pro Glu Glu Gly Leu Glu Gly Leu Ser Ser Leu Thr Glu
                      900                 905                 910


   60     Leu Phe Val Glu His Cys Asn Met Leu Lys Cys Leu Pro Glu Gly Leu
                  915                 920                 925


          Gln His Leu Thr Thr Leu Thr Ser Leu Lys Ile Arg Gly Cys Pro Gln
   65         930                 935                 940


          Leu Ile Lys Arg Cys Glu Lys Gly Ile Gly Glu Asp Trp His Lys Ile

945                 950               955              960

5      Ser His Ile Pro Asn Val Asn Ile Tyr Ile
                     965             970